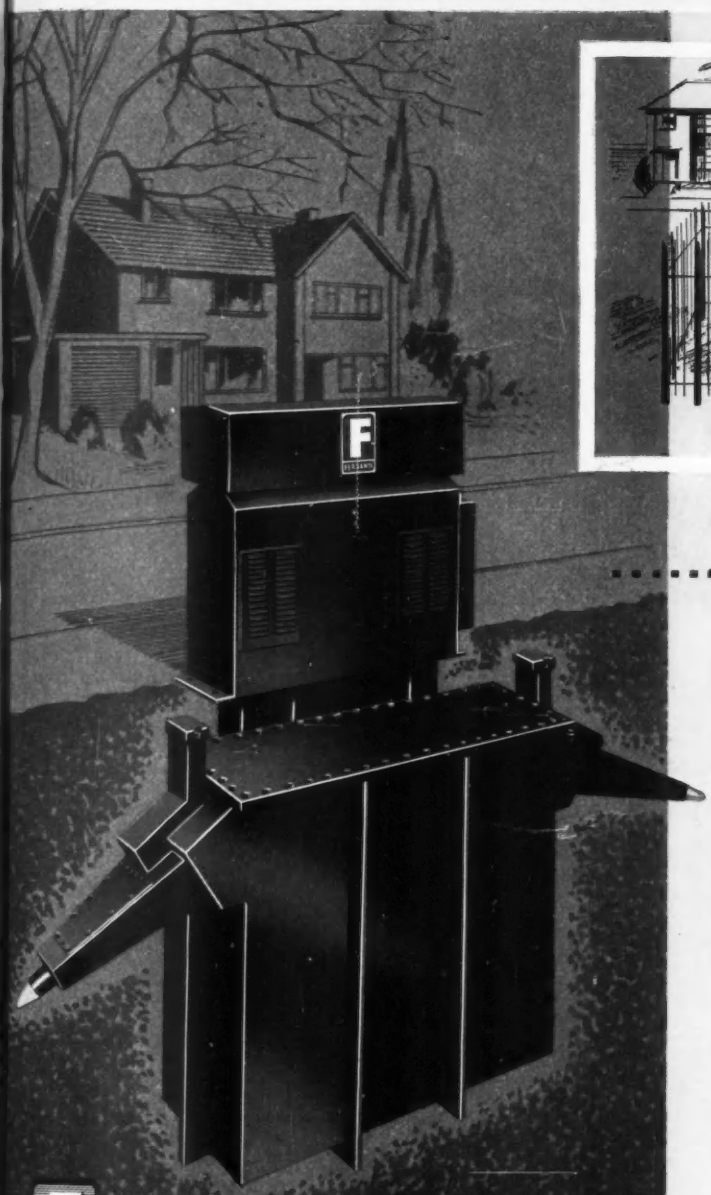
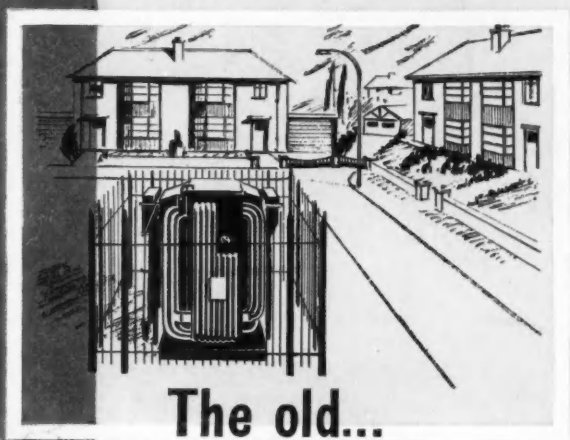
ELECTRICAL REVIEW





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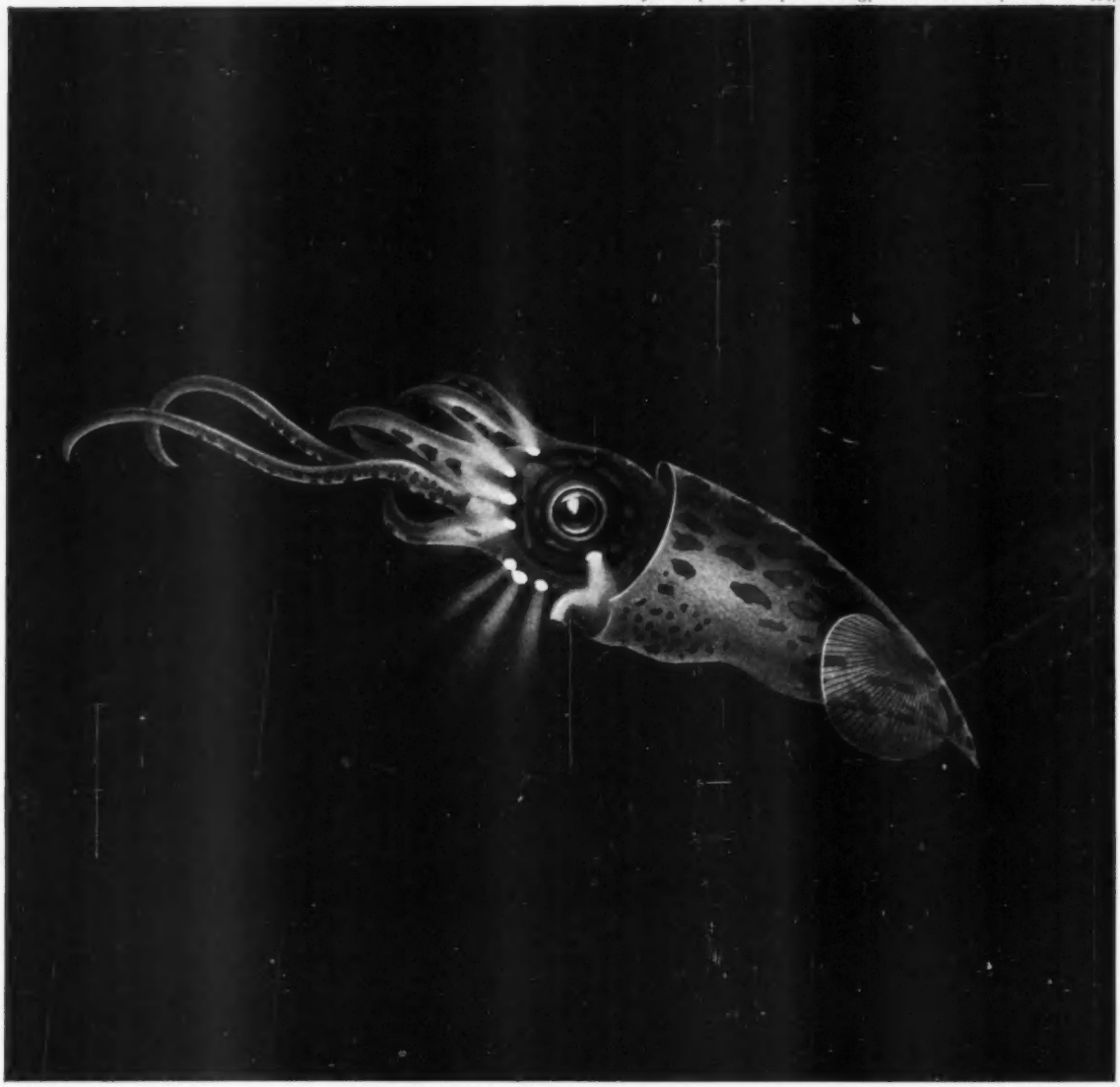

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ELECTRICAL REVIEW

23 October 1959 Vol. 165 No. 11 Established 1872

Domestic Appliance Exhibition

PROPOSALS are in train for the organisation of an exhibition of domestic electrical appliances, apparently to be an annual event. The projector is Mr. P. A. Thorogood, who is forming a company for the purpose with the title Electrical Fairs, Ltd. The Alexandra Palace, in north London, has been tentatively booked and the first exhibition is expected to take place from 23rd September to 1st October next year. Mr. Thorogood tells us that 55,000 sq ft of space will be available and that he has already had promises of support from sixty firms who produce domestic electrical equipment, as well as from the Electrical Association for Women and the National Inspection Council for Electrical Installation Contracting. Special stress will be laid, Mr. Thorogood says, on safety in the home, approved appliances and adequate wiring, and the exhibition will be open to any manufacturer of electrical appliances.

Having regard to the existence of the new B.E.A.M.A. Domestic Electrical Appliances Division, it would be thought that any exhibition of the kind proposed could be fully successful only if it had that Division's support. Indeed the securing of such support would appear to be a necessary preliminary to any move towards instituting an exhibition. Whether it is hoped to obtain the Division's collaboration at a later stage or not is uncertain, but at present the Division, which represents a very substantial part of the industry, is not a party to the project.

Some doubt seems to exist regarding the necessity for a domestic electrical appliances exhibition. Would a national "specialist" display which aims at drawing the general public actually succeed in doing this? The organisers might perhaps instance the Motor Show as exemplifying the possibilities, but we doubt whether the analogy would bear examination. Others are satisfied with the electrical display at the Ideal Home Exhibition —a show which attracts immense crowds. People who visit that exhibition do not go there to see electrical appliances particularly (there are many other attractions) but once there, for whatever reason they go, they cannot fail to be interested in the electrical section. It seems to us that the only specialised electrical equipment exhibitions assured of success are the smaller

more intimate local events which the Electricity Boards, in conjunction with manufacturers and contractors, arrange at their service centres and local halls.

When we deplored the decision to suspend the British Electrical Power Convention exhibition we had to admit that, after all, it was the manufacturers who spent the money and so it was they who must call the tune. This applies equally to the proposed Alexandra Palace exhibition. It is the manufacturers who will have to decide whether it is worth their while to take part in it. This means that they will have to gauge the extent of public interest in the show and the possibilities of securing orders or creating sufficient interest in their products to justify the cost.

EXHIBITION ACCOMMODATION

As well as becoming more numerous exhibitions are getting ever larger and many of them have outgrown the available accommodation. Even where there is enough room there is scope for improvement in the ancillary arrangements. These considerations prompted the Federation of British Industries to set up a committee early last year to examine the position. That committee's report is reviewed in this issue (page 502).

Most of the evidence received by the committee came from trade associations and only a third of them appear to have been entirely satisfied with existing facilities; about as many were presumably quite dissatisfied. The other third were displeased with certain aspects of the present buildings.

The main conclusion arrived at by the committee is that a new exhibition building in Central London is urgently needed, which confirms a view widely held for a long time. It is suggested that the capital cost (and initial losses) should be met from public funds. This would certainly be justified if exhibitions in the new building were calculated to attract large numbers of useful overseas visitors, with beneficial results upon our export trade.

PROFESSIONAL ENGINEERS' SALARIES

The results of a survey of the earnings of professional engineers in the year 1955-56 have just been published in the *Professional Engineer*, the journal of the Engineers' Guild. This survey was conducted jointly for the Guild and the Royal Commission on Doctors' and Dentists' Remuneration by the Government Social Survey. Many tables are given, based on information supplied by over 6,000 professional engineers drawn from the corporate membership of the Institutions of Civil, Mechanical and Electrical Engineers. From this it is estimated that in 1956 half the professional engineers in Great Britain earned less than £1,200, 30 per cent earned under £1,000 and only one in four received more than £1,600.

These figures suggest that engineers are rather poorly paid but the survey relates to conditions as they were three or four years ago and it is difficult to ascertain whether or not there has been any general improvement. Furthermore, it would be interesting to see the results of surveys of other professions for comparative purposes. Comparisons are drawn with the salaries of professional engineers in other countries but these are based on the various rates of exchange and do not take into account differences in the cost of living. If, as the survey indicates, professional engineers are badly paid, it is difficult to see how the general situation can be improved. As we said on a previous occasion, the nature of engineering appointments varies as much as the ability of individual engineers, so that the formulation of " scales " for general application is virtually impossible.

TECHNOLOGISTS' READING

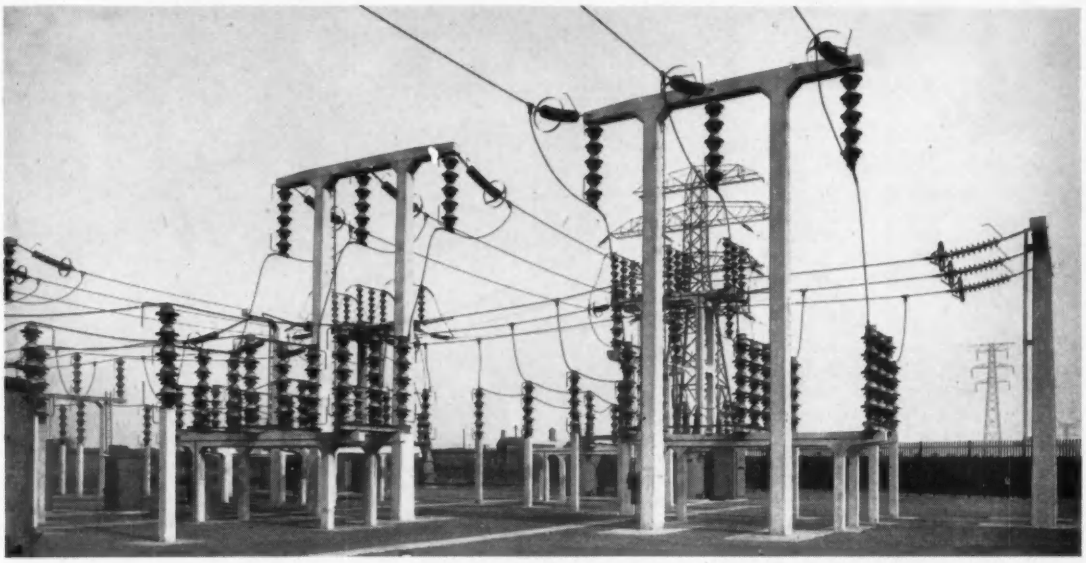
It is surprising to learn from a report upon a survey made for the Department of Scientific and Industrial Research (see page 497) that technologists in the electrical and electronics industry rely so little upon the literature of their subjects to assist them in their daily work. In dealing with current problems they appear to depend more upon personal contacts—a kind of taking in one another's washing. If the report is to be believed, technologists read mainly " to gain ideas or stimulation for new ideas or improvements, or for new methods."

One feature of the report is an analysis of the journals read by technologists who are said, on the average, to see 4·7 journals regularly, which does not seem to be bad going. An endeavour is made from the replies received to specify the sort of journal which is required. We hope that it will not be considered immodest of us to claim that the *Electrical Review* appears to meet the specification pretty well.

PROTECTION IN MINES

On 22nd April last an explosion occurred at Walton Colliery, Yorkshire, resulting in the deaths of five men. The report on the causes of, and circumstances attending, this disaster was published recently. In this document, Mr. T. A. Rogers, H.M. Chief Inspector of Mines and Quarries, concluded that the accident was an explosion of firedamp initiated by an electric arc from the damaged trailing cable of a coal-cutting machine. At the time of the accident, the ventilating system had some defects so that the concentration of methane was just above the lower limit of inflammability. The damage to the cable was thought to have been caused by a stone, possibly one projected from shotfiring. Unfortunately, trailing cables cannot be armoured but they should be protected by tiles or some other suitable covering during shotfiring.

The trailing cable was of a type in which each power conductor has a protective earthed screen. This offers protection against the risk of electric shock, but not necessarily against the ignition of firedamp by an arc. However rapidly a protective device operates, there is still a time-lag in the physical opening of the circuit-breaker and, in that time, arcing may occur. The danger can be reduced by employing a protective system in which earth fault currents are restricted. Another device, which has been suggested, is a monitoring equipment which will cut off the power supply if the firedamp content rises above some predetermined level. It is to be hoped that a reliable device of this type will emerge from present researches.



Radio Interference from H.V. Insulators

By C. H. W. CLARK, Ph.D.(Eng.)*

Electrical interference with radio and television reception has become very troublesome and a great deal of work has been done in recent years to solve the problem. Among the many sources of radio interference are high-voltage insulators on overhead lines and in substations. In this article the author explains the mechanism of interference generation by high-voltage insulators and the effect of insulator design on radio interference. The measurement of interference is considered and methods of overcoming the difficulties involved are discussed

THE problem of interference with radio and television communications is one which receives a good deal of publicity. Among the many sources of unwanted high-frequency radiations are high-voltage insulators on overhead lines and in substations. Under certain conditions small sparks or corona discharges occur on insulators and on the line conductors themselves so that they act as miniature "spark transmitters" producing high-frequency currents which are radiated by the lines.

These radiations are received by radio and television aerials and interfere to varying degrees with the music, speech or picture which it is desired to receive. The phenomenon is known as radio interference in Britain and as radio influence in the U.S.A.—in both countries conveniently abbreviated to R.I. The extent to which R.I. spoils reception depends on its intensity compared with the desired signal and also on the frequency with which it occurs.

The mechanism by which R.I. is produced on a clean dry insulator may be understood from the equivalent circuit shown in Fig. 1. Fig. 1a is a typical pin type insulator having a high-voltage conductor in its top groove tied on by means of the binding wire in the side groove. The conductor and binding wire form the h.v. electrode designated A in the simplified circuit diagram. Capacitance current flows from A to the insulator pin E and there are various paths which it may take. At a few points the conductor or binding wire will be in intimate contact with the porcelain surface, e.g. B_1. These parts of the porcelain surface will have a capacitance C_1 to the pin as indicated at the top of the circuit diagram. At other points there will be small air gaps between the wires and the porcelain surfaces B_2, B_3, etc. These surfaces will have capacitances C_2, C_3, etc., to the pin. The charging currents of these capacitors must flow through the gaps of various magnitude between different parts of the conductor or binding wires and the porcelain surface. Air gaps may also exist between the pin and the porcelain, and these gaps are also in the path of the capacitance current.

If a gradually increasing alternating voltage is applied to such an insulator these small air gaps will at first be non-conducting, but as the voltage rises they will break down one after another to allow sudden surges of current to flow into the elementary capacitances C_2, C_3, etc. It

* Steatite & Porcelain Products, Ltd.

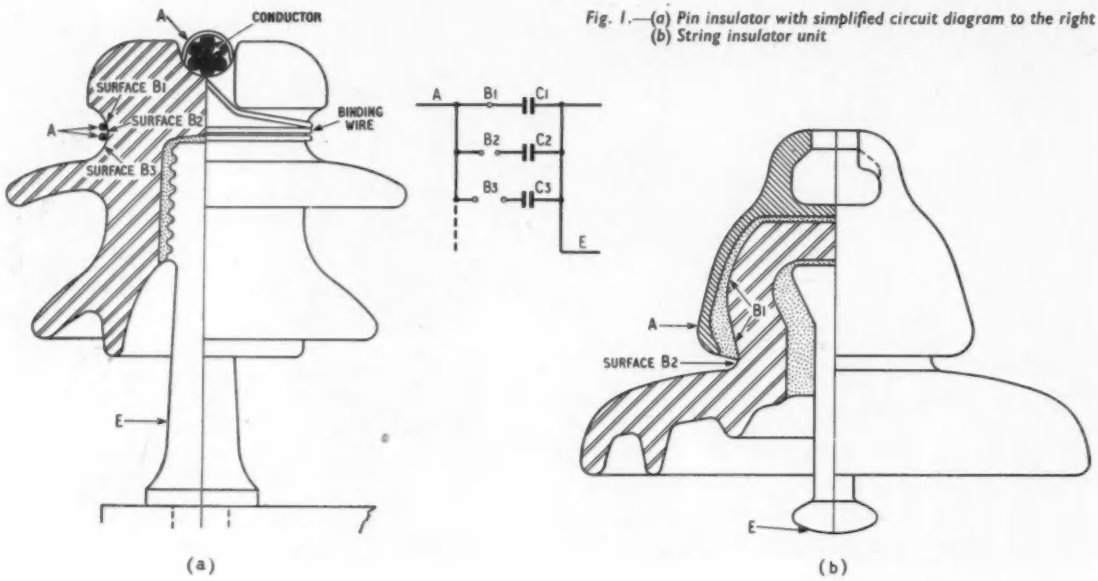


Fig. 1.—(a) Pin insulator with simplified circuit diagram to the right (b) String insulator unit

is these current surges which are the source of R.I. When each gap breaks down the time of formation of the spark is of the order of 10^{-8} sec and the current surges are very sharply peaked. They may be considered as being built up from a whole spectrum of frequencies up to at least some hundreds of Mc/s. Normally, there is no oscillatory circuit to emphasise any one frequency although standing waves are sometimes set up on short sections of line. The radiation is sometimes described as " white " by analogy with white light the spectrum of which is continuous with no marked increase in intensity at any one frequency.

The pin insulator, with the h.v. electrode bound to the porcelain, is perhaps the worst h.v. insulator for producing R.I. Insulators which have their metal fittings cemented to the porcelain cause less R.I. (Fig. 1b). The cement has a low resistance compared with the capacitive impedance of the porcelain at power frequency and is in intimate contact with the porcelain. In addition to the capacitance of the porcelain directly between the electrodes there is a considerable fringe capacitance through the adjacent porcelain. The fringe capacitance has an air gap in series with it and when sufficient voltage is applied to the insulator discharges take place from the edge of the cement to the adjacent porcelain. At a sufficiently high voltage these discharges may extend several centimetres and are then known as sliding discharges. As the resistance of the cement is negligible the basic circuit diagram applies to the cemented insulator of Fig. 1b as well as to the pin insulator (Fig. 1a). It also applies to other insulators such as post insulators, bushings, etc., but the relative performance of various types of insulator depends on various secondary factors which can be of great importance.

In the simplified circuit diagram of Fig. 1, the capacitances of the gaps are omitted. These capacitances are small and a major fraction of the total applied voltage falls across the gaps until they break down. Dirt and moisture films on the porcelain surface may also shunt the gaps and thus tend to reduce the voltage across them while during rain many of the gaps may be short circuited. Damp or rainy weather and surface deposits may therefore reduce R.I. arising as described above.

When the whole surface of a h.v. insulator becomes dirty or wet a leakage current flows. The dirt may be unevenly distributed and have small gaps, while the moisture film is unstable due to the heating effect of the leakage current and, even if it is initially continuous, will soon break up owing to local drying out. If the major part of the surface remains conducting, the gaps become overstressed and suddenly break down as the voltage rises during each half-cycle. The resulting current surges are a source of R.I. Thus, although in some cases dirt and moisture, by increasing the surface conductivity, may tend to suppress R.I., more severe pollution can itself cause it. Alleviation of this type of R.I. can be obtained by the various means adopted to reduce the risk of flashover due to pollution.

Two other sources of R.I. may be mentioned. At the higher voltages the metal fittings may cause corona from any sharp edges in the same way as corona may occur on the line conductor if its diameter is too small. Corona current consists of a series of short-duration pulses and is a source of R.I. Metal fittings, which are free from corona when new, may deteriorate due to contamination in the same way that line conductors do.[1] Many insulators are built up of a number of units with the metal fittings joined together, for example, an insulator string with ball and socket or tongue and clevis couplings. If the connections are flexible, dirt may be trapped between adjacent fittings and become compressed to a hard insulating film. Through this film the capacitance current of the insulator passes in the form of small sparks, breakdown occurring as the voltage rises in each half-cycle. The R.I. arising in this way can be prevented by adequate bonding of the metal fittings to one another. The dirt films become conducting when wet and this form of R.I. also tends to be suppressed in wet weather.

Effect of Insulator Design

The circuit diagram in Fig. 1 was simplified by omitting the impedances shunting the gaps, but it is necessary to consider these impedances if the factors affecting R.I. performances are to be assessed. Fig. 2 shows part of a cemented insulator and indicates the make-up of the impedance shunting the gap to a typical point on the

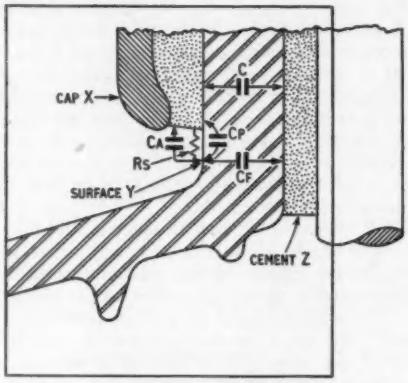


Fig. 2.—Diagram of part of cemented insulator

porcelain surface, Y (equivalent to B_2, B_3, etc., in Fig. 1). Discharge across the gap will occur if the potential difference between X and Y becomes great enough and XYZ may be considered as a potential divider with the total voltage V applied between X and Z. Between X and Y there is a capacitance, composed of C_A with air dielectric and C_P with porcelain dielectric and also a surface leakage resistance R_S. Between Y and Z there is a component of fringe capacitance C_F. The proportion of the total voltage, V, which falls across the gap is given by the expression:—

$$\frac{C_F}{C_F+C_A+C_P+1/j\omega R_S}$$

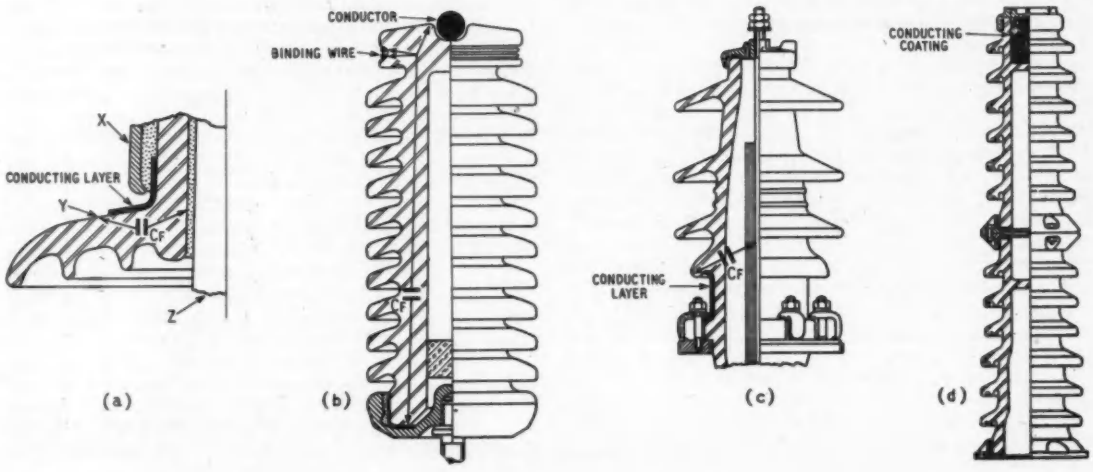
It will be seen that this voltage across the gap approaches the full voltage, V if R_S is large and C_A and C_P are small compared with C_F. Gap breakdown, and therefore R.I., then occurs at a relatively low applied voltage. If, on the other hand, C_A, C_P, or $1/j\omega R_S$ increase compared with C_F, the fraction becomes small and breakdown of the gaps occurs only at a relatively high applied voltage. The main capacitance C between the cap and pin through the porcelain does not affect the voltage across the gap XY.

In the case of a pin insulator the point Y might be under the binding wire where the latter does not quite touch the porcelain and C_P would be practically zero while R_S would be very high. It is for this reason that the R.I. performance of a pin insulator is poor, i.e. sparking across the gaps starts at a relatively low value of applied voltage, V. The application of a conducting layer to the porcelain surface in contact with the binding wire short circuits the gaps under the wire and makes the R.I. performance of the pin insulator no worse than that of a cemented insulator. If the conducting layer is extended some distance over the top shed further improvement may be achieved as described below with reference to Fig. 3a.

In the case of a cemented insulator, if the voltage is only sufficient to cause small surface discharges, the dimension XY is very small and the values of C_A and C_P depend very little on factors such as the size of the cap or the thickness of the porcelain. Moreover, R_S depends only on the condition of the porcelain surface and on the humidity of the ambient air. To reduce the voltage across the gap and thus improve R.I. performance the only factor which can normally be modified is C_F. This is achieved in practical insulators in various ways, examples of which are illustrated in Fig. 3. Fig. 3a shows a conducting layer applied to the top shed of a cap-and-pin string insulator or post insulator unit. The distance of Y from the pin Z is increased and the sectional area of the porcelain between Y and Z is also reduced compared with Fig. 2. Both factors reduce C_F. In the line-post insulator (Fig. 3b) the distance from Y to Z is much larger still. Fig. 3c shows a bushing in which the highest stress occurs at the earthed flange and not at the h.v. electrode. A conducting layer extending from the flange and terminating in a re-entrant lip reduces C_F. The re-entrant lip is a very effective way of preventing corona, since the end of the conducting layer, from which corona might occur, is screened from the h.v. conductor thus making the effective value of C_F practically zero. Fig. 3d shows a cylindrical post insulator with internal metallising at the top. Owing to the large distance between the high-voltage cap and the earthed flange the value of C_F is very low for a cylindrical post. For very high voltages, of the order of 400 kV or more, it may be necessary to use internal metallising at the top thus increasing C_P and still further improving the R.I. performance.

The bigger h.v. insulators may consist of several porcelain shells cemented together and often of several

Fig. 3.—(a) Conducting layer on top shed. (b) Linepost insulator. (c) Bushing with re-entrant lip. (d) Very high voltage cylindrical post insulator



units bolted or otherwise jointed together. The total insulator thus has several insulating components connected in series and forming a potential divider. The distribution of voltage between the insulating components is by no means uniform since stray capacitances are comparable with the component capacitances. The non-uniform voltage distribution usually results in the live end units being highly stressed. For example, the end unit of a ten-unit string of suspension insulators may take 20 to 25 per cent of the total voltage instead of only ten per cent and this means that R.I. will start when the voltage applied to the string is only four to five times the corona voltage of a single unit, although with an ideal string the value would be ten times. The R.I. performance of long multi-unit insulators is therefore improved by grading rings which make the voltage distribution more uniform.

Measurements of R.I.

The obvious method of measuring R.I. is by means of a calibrated radio receiver and aerial. This is the method used "in the field," for example, near a transmission line, the radiated R.I. field strength being measured in microvolts per metre. If it is desired to compare two sources of R.I. in the laboratory, however, it is less convenient to use the measuring set in this way. This is partly because the strength of the radiated R.I. depends not only on the characteristics of the source but also on the efficiency as a transmitting aerial of the conductors connected to it. Moreover, the receiving aerial picks up all signals indiscriminately and other radiations are frequently large compared with the R.I. coming from the test object. These difficulties are minimised if the R.I. current generated by the test piece is measured directly and various circuits have been proposed for doing this. The current is usually measured in terms of the voltage drop across a resistor through which it flows and its value is given in microvolts. Fundamentally, however, a source of R.I., such as a h.v. insulator, is a current generator and the R.I. level in microvolts is meaningless unless the value of the resistor is also given. The R.I. current generated by an insulator in service flows into an overhead line often extending a considerable length in each direction. The characteristic impedance of the line is of the order of 500 ohms, and the resistance into which the current flows is therefore of the order of 250 ohms since the two parts of the line on either side of the insulator are in effect connected in parallel.

Fig. 4 shows circuits which have been used or proposed for measuring R.I. from a source such as an insulator. Fig. 4a is the N.E.M.A. circuit[2] generally accepted in the U.S.A. since its publication in 1940. This appears to be the only published specification for this type of measurement and has been widely used in other countries. It has become common practice to measure R.I. with this circuit at a frequency of 1 Mc/s. This frequency is chosen because (a) it comes into the band widely used for sound broadcasting, (b) at higher frequencies the difficulties of measurement are increased and (c) most sources of R.I. while producing a continuous spectrum of frequencies show a progressive falling off in R.I. level as the frequency rises above 1 Mc/s.

The N.E.M.A. circuit has been criticised in several details. The condenser specified (0·0025 μF) is large and expensive at the higher voltages and at several hundred kV it may represent an excessive load on the testing transformer. A condenser of this size is normally a paper condenser built up of various units connected in series and parallel and may well be unsuitable for frequencies above 1 Mc/s, when its inductance may be appreciable and its physical dimensions comparable with the wavelength of the radiation. This frequency limitation may be more serious in Britain where interference is more often experienced on television using frequencies of about 60 Mc/s than at 1 Mc/s.

The circuit of Fig. 4b in which the R.I. current is measured in the h.v. lead, using a measuring set in a Faraday cage, has obvious disadvantages and is unlikely to be widely used. The circuit of Fig. 4c has received some support and has the merit of simplicity since the h.v. condenser may, in certain circumstances, be omitted. These circuits have been discussed in a recent C.I.G.R.E. paper.[3]

The calibrated radio receiver or measuring set must be closely standardised if results are to be reproducible. The R.I. signal being measured consists of a number of isolated peaks and the nuisance caused depends both on the magnitude of individual peaks and on their repetition frequency. Most R.I. measuring sets indicate the so-called "quasi-peak" value. The discharge time constant of the detector circuit is long and its charge time constant short. If the repetition rate of the pulses constituting the R.I. is high, little discharge of the detector circuit occurs between one pulse and the next. The measuring set then functions as a peak voltmeter although it is normally calibrated to indicate the r.m.s. value of an equivalent sinusoidal voltage. If the repetition rate is low the meter indications will be reduced. The British Standard for R.I. measuring apparatus[4] lays down strict requirements for the time constants of the detector circuit and also other characteristics such as bandwidth. The British Standard is based on recommendations of the C.I.S.P.R. (Special Committee on Radio Interference of

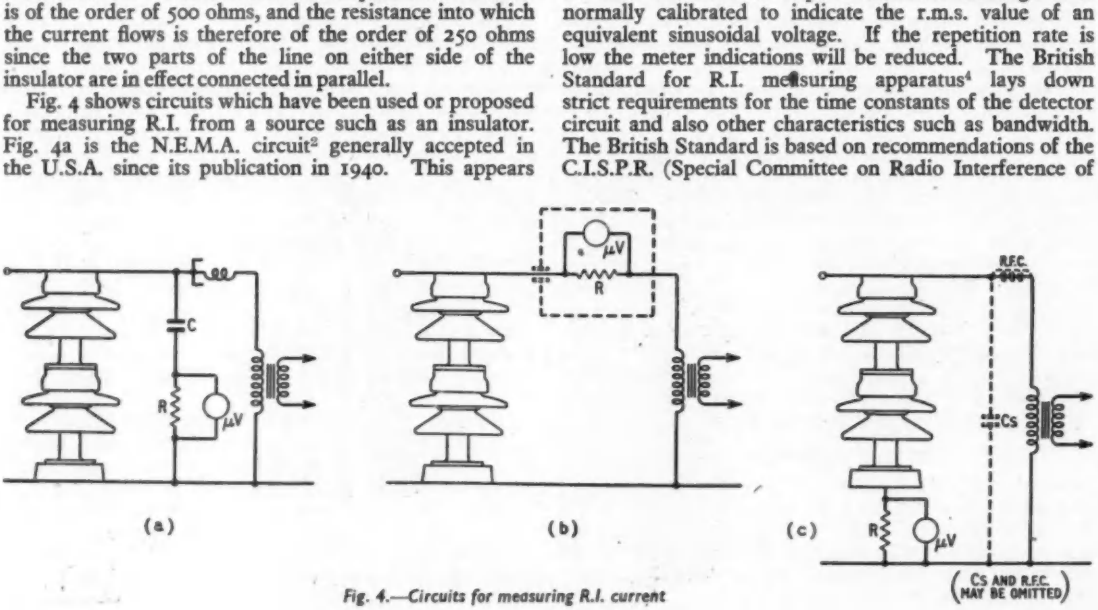


Fig. 4.—Circuits for measuring R.I. current

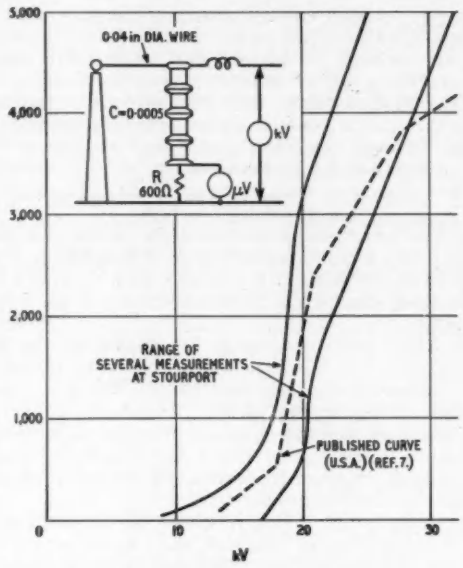


Fig. 5.—Radio interference from smooth wire

the International Electrotechnical Commission). Other national standards specify somewhat different characteristics and different sets nominally complying with the same standard have proved in practice to give different meter readings when measuring the same R.I. signal. Errors of 10 dB are common and 24 dB have been reported.[1] These correspond to R.I. voltage or current ratios of 3 to 1 and 15 to 1.

For some years measurements have been made on various insulators in the high-voltage laboratory at Stourport. The majority of measurements have been made using the N.E.M.A. circuit (Fig. 4a) at a frequency of 1 Mc/s, the measuring set being a British Post Office set R.I. No. 1. At voltages up to 50 kV an oil impregnated paper condenser was used at C and this appeared to be suitable for frequencies in the 1 to 30 Mc/s range since approximately the same meter reading was obtained at different frequencies in this range for certain types of test piece. By using a number of these paper condensers and connecting them in various series and parallel arrangements it was demonstrated that in practice the value of the condenser C is not critical and at 1 Mc/s measurements have been made up to 240 kV using a stack of condensers having a capacitance of 0·0005 μF.

It was also found that the voltage read by the measuring set was directly proportional to the resistance R, at least over the range 75 to 1,000 ohms. This confirms that the insulator is acting as a constant-current generator and that no appreciable errors arise due to part of the R.I. current being by-passed away from the measuring set by stray capacitances. Measurements are therefore normally made using 150 ohms as the value of R, the meter reading being adjusted to give the R.I. level which would be read using the N.E.M.A. standard resistance of 600 ohms.

When using the stack of paper condensers (C=500 pF) it was found that re-tuning the measuring set from 1 Mc/s to 30 Mc/s resulted in an apparent fall of up to 50 dB in the R.I. signal. The paper condenser was then replaced by a ceramic condenser with a capacitance of 80 pF and having very small dimensions since the ceramic was a barium titanate type having a permittivity of about 3,000. With this condenser the same R.I. level was measured at 1 Mc/s as had been measured using the paper condenser. Moreover, for some test pieces there was practically no change in R.I. level when the frequency was changed from 1 to 30 Mc/s. These tests show that while the capacitance of the condenser is not critical its physical dimensions and type of dielectric may be important, especially at frequencies much higher than 1 Mc/s.

It was noted earlier[1] that measuring sets even of nominally the same characteristics may give very different results. It was therefore felt that some form of standard R.I. source easily reproducible in any high-voltage laboratory might be useful. In view of the very great disparity between different sets, even a comparatively rough standard would be useful. In an American publication[7] results were given for tests on a smooth 0·04in diameter wire 20ft long supported 10ft 4in above ground level. A similar wire was set up at Stourport on a number of occasions and it was found that moderately reproducible results were obtained and agreed well with the American published figures up to R.I. levels at which measurements are normally made, i.e. up to well over 1,000 μV in the N.E.M.A. circuit. Above about 4,000 μV the Stourport curve begins to rise considerably above the American published curve (see Fig. 5). It is interesting to note that visible and audible corona started quite suddenly on this wire at about 22 kV although considerable R.I. signals were measured below this voltage. While the accuracy of reproducibility is not of the same order as, for example, that of the sphere gap, it would appear that a smooth wire could be used as an approximate standard to control the grosser errors to which R.I. measurements are subject.

Fig. 6 shows some typical R.I. characteristic curves for a three-unit pedestal post insulator suitable for 66 kV working voltage. At low voltages the set measures a background noise due to radiations picked up by the high-voltage conductor acting as a receiving aerial. The magnitude of the background noise is usually fairly constant during a measurement but may have any value from a few μV up to 10 or 20 μV. Occasionally, it was found to fluctuate quite rapidly, as indicated by the shaded band for test No. 2 in Fig. 6. The magnitude of the background noise depends on the time of day and on the locality. It may be high enough to render measurements at reasonable R.I. levels impossible in a few cases, for example, in normal working hours in a busy factory. In given circumstances the level of background noise is higher when measurements are being made on bigger insulators since the high-voltage conductor is then longer and is situated at a greater height above ground level.

When R.I. first begins to be generated by the test piece it is initially very small and a carefully constructed R.I. curve appears to be asymptotic to the line representing background noise. Measurements in this region tend to be variable and repeat tests on the same insulator often give very different results. Any attempt to measure the R.I. starting voltage is quite impracticable owing to this variable performance of the insulator, the variation of background noise and the asymptotic shape of the curve. These difficulties are minimised by the common American practice of measuring not the R.I. starting voltage but the voltage at which the R.I. reaches a specified level. The specified level for the size of insulator to which Fig. 6 refers is 200 μV with the N.E.M.A. circuit and it will be seen that the curves of Fig. 6 indicate that the voltage at which this level is reached is between 53 and 57 kV whereas values for R.I. starting voltage could be judged to be between 27 and 45 kV, the former showing a range of 7 per cent, the latter of 50 per cent.

This and similar results for other insulators strongly

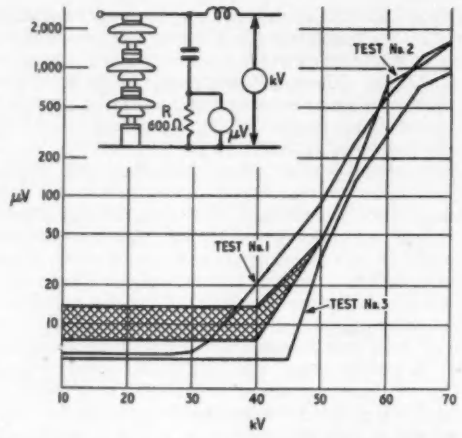


Fig. 6.—Radio interference from 66 kV pedestal post insulator

support the American practice of working to specified R.I. levels. Moreover, the use of higher levels for higher voltage insulators is logical, as conductors on very-high-voltage systems are not normally completely free from corona and it is obviously unsound to specify a very good performance for one item on a system when considerable R.I. is allowed from another item. Measurements in the U.S.A. applying the circuit of Fig. 4a to high-voltage lines have indicated levels of 5,000 to 10,000 μV at normal working voltage.[5,6]

Very variable results are obtained in measurements of R.I. and even in repeat measurements on the same test piece using the same apparatus differences of 6 to 10 dB are quite common. The question naturally arises whether these variations reflect variation in atmospheric conditions. Tests on overhead lines in the U.S.A.[6] showed that 1 per cent change in relative air density could produce a change of 8 per cent or more in the R.I. level. Other investigations have led to the conclusions that air density and humidity have little effect.[7] There are fewer reports on the effect of atmospheric conditions on insulator performance. Tests in 1934[8] showed that while some insulators improved markedly with increasing humidity up to about 60 per cent relative humidity others were little affected by humidity. Tests at Stourport have also shown that different insulators may be affected to varying degrees by change in humidity though no very marked effect has been found due to varying relative air density arising from normal temperature and pressure changes. This subject is complex and further work on it is necessary.

The 1934 tests[8] showed that some insulators had a better R.I. performance in rain or when contaminated than when clean and dry. Other observers have also noted the beneficial effect of rain.[9] In fact, it is often stated that tests on a transmission line in fine and wet weather show whether the R.I. is predominantly caused by the insulators or by corona on the conductor since insulator R.I. is reduced by rain while conductor R.I. is increased. Tests at Stourport indicate that here again the facts are rather complicated. It appears that there is still much to be learned on the effects of pollution and weather on the R.I. performance of insulators.

Conclusions

(1) An insulator may produce R.I. by a number of different mechanisms all of which depend on the breakdown of small gaps to allow sudden pulse-like increases in the capacitance or leakage current. The gaps may be (a) between a metal fitting and an adjacent point on the porcelain surface, (b) between two metal fittings partly insulated by a film of dirt. (c) between two conducting deposits on the insulator surface or (d) into the adjacent air in the case of a corona discharge from a sharp metal fitting. Radical change in design may be necessary to give an improved R.I. performance but improvements may be obtained in some cases by the application of conducting coatings to parts of the insulator surface.

(2) The R.I. current generated by an insulator has components with a continuous spectrum of frequencies in the range from less than 1 Mc/s to more than 100 Mc/s, but the intensity usually falls off with increasing frequency in this range.

(3) The commonest circuit for measuring the R.I. current is the N.E.M.A. circuit published in 1940, and the usual practice is to measure at 1 Mc/s. The R.I. current is taken from the high-voltage conductor through a coupling condenser and a resistor to earth. The voltage across the resistor is measured by a calibrated radio receiver. For a given R.I. current the voltage is proportional to the resistance of this resistor.

(4) In using the N.E.M.A. circuit for measuring the R.I. generated by an insulator the capacitance of the coupling condenser is not critical and accurate measurements can be made with a condenser having a capacitance of about 80 pF instead of the 2,500 pF specified.

The type of condenser may be more critical. Care must be taken to ensure that the condenser is suitable for the frequency at which measurements are being made and this may be difficult at frequencies much above 1 Mc/s. Care must also be taken to reduce stray capacitances through which the R.I. current might be by-passed to earth without reaching the measuring set.

(5) R.I. measuring sets, by international agreement, measure the quasi-peak value of R.I. voltage and the details of the set need to be carefully standardised to ensure comparable measurements. Differences between measurements with various sets may be 10 or even 24 dB. In view of these possible errors it is suggested that a standard source of corona, e.g. a long smooth wire, might be used to give an approximate confirmation of the accuracy of the measuring set under actual working conditions.

(6) It is considered sound practice to characterise an insulator not by the voltage at which R.I. starts but by the voltage at which it reaches a defined level. The appropriate level is higher for big insulators than for small ones and the following levels are suggested since they are in agreement with practice originating in the U.S.A. and already widely used in other countries. An insulator is considered R.I. free if these levels are not exceeded at a test voltage 10 per cent above its normal working voltage to earth.

Insulator Rated Working Voltage, kV (three-phase)	Up to 15	16 to 33	34 to 88	89 to 220	Above 220
R.I. Level:—					
dB above 1 microvolt across a 150 ohm resistor	22	28	34	42	48
Microvolts in the N.E.M.A. circuit using a 600 ohm resistor	50	100	200	500	1,000

(7) Different samples of insulators of the same design vary considerably in their R.I. performance and even the same sample measured on different occasions gives different results. Evidence on the effects of atmospheric conditions (temperature, pressure and humidity) is conflicting, but these factors may have far greater effects on R.I. performance than on flashover voltages. The effects

of rain, contamination, etc., are also complex. It is often assumed that rain improves the R.I. performance of an insulator (although it increases corona from the line conductor) and laboratory tests have confirmed that some insulators improve when wet. Further work on the effects of atmospheric conditions is needed.

The author wishes to thank Steatite & Porcelain Products, Ltd., for permission to publish this article.

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What Do You Read?

RESULTS OF A D.S.I.R. SURVEY

IN 1956 the Central Office of Information carried out a survey for the Department of Scientific and Industrial Research into the use of technical litefature by over a thousand technologists in 127 establishments in the electrical and electronics industries. The term "technologist" covers scientists and others in higher technical grades engaged either on research work, production supervision or management. The results are given fully in a report "The Use of Technical Literature by Industrial Technologists," by Christopher Scott and Leslie T. Wilkins (obtainable at 22s 6d from the Librarian, C.O.I. Social Survey, Montague Mansions (Block 5), York Street, London, W.1). An outline of the important findings is, however, given in a 24-page booklet, "What They Read and Why," published at 2s by the Information Division of the D.S.I.R., Charles House, 5-11, Regent Street, London, S.W.1.

In this booklet it is said that "the electrical and electronics industries were chosen because they are firmly based on modern science and engineering, consume a large amount of technical literature and should therefore yield *favourable* results. Yet the picture revealed is not a cheering one. The technologist, as defined here, makes little use of the up-to-date printed material which is available to him."

A chapter on "Why Technologists Read" suggests that only a very small proportion of them use libraries or other sources of literature. Most of those requiring technical information get into touch with people (within or outside their own establishment) who would be likely to answer their questions. A technologist is more likely to refer to literature as a first step if the problem on which he is engaged involves long-term fundamental research in, say, electrical or mathematical matters.

The conclusion is reached that technologists read for ideas and stimulation and, in support of this, it is said that 60 per cent of those approached look for new ideas, improvements and new methods in "written" material. To the majority of the respondents this means the scientific, technical or trade Press.

Abstracts are read by 21 per cent for searches; twice as many use them wholly or mainly for news and the remainder for both—about equally. It was found that technologists do most of their *reading* at home although they take up a journal more often at work than at home. This is perhaps accounted for by the fact that most of the journals (62 per cent) that reach them are circulated within their establishments; only 20 per cent are bought as personal copies; on the average each technologist pays for one journal.

The next chapter of the booklet is headed "Who Reads What." The technologists who were approached were asked which journals they saw regularly. Among the more popular publications *Wireless World* was mentioned by 268 respondents, *Machinery* by 198, *Electronic Engineering* by 187, the *Electrical Review* by 162, *Electronics* by 127, the *I.E.E. Journal* by 104 and the *Wireless Engineer* (now the *Electronic and Radio Engineer*) by 66. A list is also given of journals "read or scanned" during the past year. From these lists it is concluded that the most popular journal among technologists in the electrical industry would deal with electrical, control or production engineering; require previous knowledge of the subject, but no academic qualifications; appear at least once a month; have between 40 and 100 pages of text and a large number of advertisements; avoid reports of fundamental work; and contain review articles, abstracts or book reviews, notes on new equipment, news of appointments, meetings, etc., and job advertisements.

From the replies received it is calculated that on the average the electrical/electronics technologist sees 4·7 journals regularly and reads or "scans" 7·8 different publications during one year. Those concerned with management are the most extensive readers and higher-degree men even more so. Comment is offered on the poor use which technologists generally make of library facilities. It is also said that the cost of journals may deter some from reading more.

In a summary of findings it is said that making good use of technical literature is one of the marks of a well-trained and active technologist. When he finds a useful or interesting article it is usually during his own reading and more often by chance than design. Written material is acknowledged by technologists to be their most important source of ideas and stimulation.

The booklet concludes with questions addressed to technologists, managers, librarians and information officers, technical teachers and editors, bringing out possible shortcomings which they might attempt to remedy.

Future of Thermal Generation

UNTIL 1890, dynamos had been driven by steam engines but, in that year, the Newcastle & District Electric Light Co., Ltd., installed and operated two 75 kW turbo-alternators driven by turbines designed and constructed by Sir Charles Parsons. In his chairman's address to the North Western Centre of the Institution of Electrical Engineers recently, Mr. F. J. Hutchinson went on to describe the architecture of the power stations, varying from the "baronial" to the aluminium cladding exemplified at Kincardine-on-Forth.

The early steam-raising equipment had consisted progressively of fire tube boilers, Lancashire boilers and water tube boilers. In the 'twenties, six stoker-fired boilers, each of 45,000 lb/hr output, were associated with one 20 MW turbo-alternator. Full interconnection existed between all boilers and turbines in the station. This steam and feed range interconnection had persisted until the war and for a little time afterwards but, owing to the development of the pulverised fuel furnace, the number of boilers associated with each turbine had become progressively less, until one boiler was matched with one turbine and the steam and feed piping of one boiler-turbine arrangement was not connected with that of any other.

Capacity and Cost

The trends of technical progress and cost are indicated in Fig. 1. The full line marked A shows the tremendous strides that were made during the last ten years in the capacity of the turbo-alternator boiler units, culminating with the 550 MW sets. Alongside this trend there had followed a considerable increase in steam pressures and a more modest increase in steam temperatures. These are shown as curves B and C respectively.

It had been established by economic experts that the purchasing value of money had depreciated by approximately 66 per cent from the early 'thirties to the early 'fifties and curve D shows that the cost per kW had followed that trend. In 1948 the British Electricity Authority—now succeeded by the Central Electricity Generating Board—was formed and very soon, about 1953, the upward trend was halted. In 1957, a 120 MW station at Rogerstone had been built for £59/kW, and Mr. Hutchinson understood that the 1,000 MW station at High Marnham would cost £45/kW.

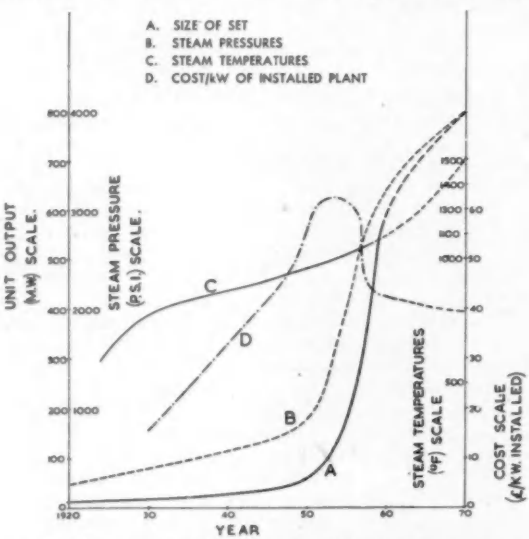


Fig. 1.—Diagram showing 30-year variation of size of turbo-alternators, steam pressures and temperatures and cost/kW of installed plant

Mr. Hutchinson then suggested that sets of 800 MW would shortly not be uncommon and that designs for supercritical pressures of 5,000 p.s.i. associated with temperatures of 1,200/1,500°F would be available within the next ten years.

With a 1,200 MW station, a decrease of 2·5 per cent in the heat rate could be obtained by increasing the subcritical steam pressure of 2,350 p.s.i. to the supercritical pressure of 4,500 p.s.i. without any increase in steam temperature. Increases in the steam temperature as the pressure increased would offer a still greater reward of 6·75 per cent.

Higher Temperatures

The realisation of supercritical steam pressures and extra high temperatures was more difficult to achieve than had yet been made clear. In the establishment of a supercritical extra-high-temperature steam cycle, the main steam pipes were considered by designers in the users' organisations, and by manufacturers, to be the most difficult portion of the plant for which to obtain an economical solution. They had to be constructed throughout of special heat-resisting steel which a few years ago was confined to the austenitic range and the price in those days had made the use of this material uneconomic. On the Continent, the price of austenitic steel at the present time was approximately 60 per cent of what it had been four years ago. Recent researches had produced a 13 per cent chrome steel which had very suitable characteristics in the temperature range required and this, coupled with the increasing use of austenitic material, might have the effect of lowering its price still further. The amount of austenitic material required for the higher temperature zones of the boiler and superheater and for the turbine were not considered to be economically unjustifiable.

As steam pressures were increased to the region of the supercritical, the natural circulation boiler which was in general use in this country began to require the help of forced circulation. From the point where the supercritical pressure was reached, if not before, the fully forced circulation boiler had to be used. This was popularly known as the "once through" boiler and was primarily of the Benson or Sulzer type. In such a boiler, two stages of reheat were included and the reserve feed water tank was of a pressurised type to provide at least half-an-hour's supply of feed water to the boilers. The quality of the water had to be in accordance with the most stringent specification.

The average total cost of generation in the middle 'thirties was approximately 0·49d/kWh when coal was purchasable at under 20s per ton and with the price levels ruling at the time. Today, with general price levels multiplied by a factor of three and coal costing about 80s per ton, the average cost of generation was approximately 0·9d/kWh. This was indeed a tribute to the electricity supply industry. Mr. Hutchinson suggested, however, that in Britain a supercritical pressure, high-temperature, 1,200 MW station would generate electrical energy at a cost of under 0·5d/kWh.

ELECTRICAL INSPECTION METHODS

Activities of a Government Directorate

BEFORE 1957, the inspection organisation of the Ministry of Supply was grouped according to user Services. This system meant that a number of different inspectors were employed by different Services in inspecting the same type of equipment at the same factories. Since then, the separate inspection departments of the various Services have been fused together and new departments created according to particular branches of science. One of the new departments, the Electrical Inspection Directorate, was formed in 1958 and represents a concentration of the techniques in the electrical and electronic fields which has resulted from merging together like elements of three of the original Service inspectorates. Thus, the electrical aspects of the work of the original Aeronautical Inspection Directorate, the Inspectorate of Armaments and the Inspectorate of Electrical and Mechanical Equipment are now combined in the Electrical Inspection Directorate.

The functions of the E.I.D. are divided into routine factory inspection, including sampling and type tests, and technical direction, involving pre-contract work and post-design control. Post-design control relates mainly to Army equipments and entails full technical control of an equipment once it has been released for production. This embraces the investigation of all user defect reports and consequent modification instructions. For War Office equipments, E.I.D. also provides pre-contract service to ensure that full manufacturing and other information for tender and contract purposes are available.

At the headquarters of E.I.D. at Chislehurst, a number of original techniques for inspection of samples have been developed in the various laboratories.

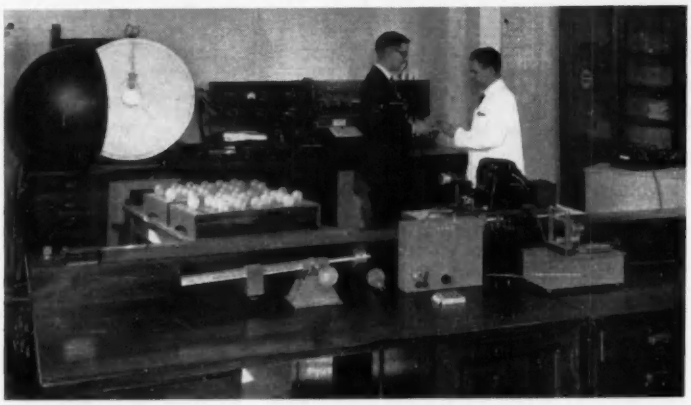
Electrical Laboratory

The electrical branch is responsible for the technical direction and inspection of electrical equipment for Services' power stations, transmission and distribution systems, power and lighting equipment for industrial and domestic installations, electric lamps and industrial applications. The function of the electrical laboratory at Chislehurst is to carry out tests on samples of electrical equipment in the course of production for contracts and orders placed by the Ministry of Supply, to provide technical assessment of samples offered in connection with tenders and to investigate defects of electrical equipment encountered in service.

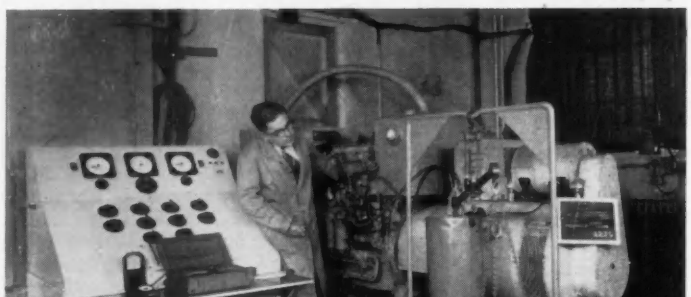
Lamp testing is one of the most important functions of the laboratory. Lamps are continually being life tested to check the maintenance of quality of those supplied to Government orders on running contracts. During the past year, this quality testing monitored the supply of over nine million lamps. Samples of lamps from running contracts are checked at Chislehurst for lumens and watts, light centre length and torsion. If the lamps are satisfactory at this stage, they are subjected to a life test. A further check is made during life tests for lumen maintenance, after which the lamps are operated until the end of their life. A lamp may become dangerous at the end of its life due to short circuits within the cap, explosions and other defects. If these defects occur in more than a certain number of lamps from a given batch, the entire batch is rejected. Copies of test results for g.l.s. lamps are supplied (by agreement with manufacturers) to the Central Electricity Generating Board, the British Transport Commission and the National Coal Board. In this respect, the quality control of lamps exercised by the E.I.D. ensures that all lamps manufactured in Britain are to a certain standard, including those sold to the general public.

The lamp section includes a laboratory concerned with the colorimetry of fluorescent lamps. The colorimeter in use was manufactured by Siemens Bros. Light from the lamp under test is passed through a narrow slit at the entrance to the colorimeter through a collimator lens and into a prism. The spectrum formed by the prism is focused by another lens on to a photocell which is connected to a sensitive galvanometer to indicate the amount of light falling on the photocell. Filters intercept the spectrum falling on the photocell, thus making it possible for light from the required parts of the spectrum to be measured.

Testing of instruments, which is also carried out by the electrical branch, may conveniently be divided into two categories, routine tests and sample tests. Routine tests involve visual examinations, accuracy, pivot stick, damping, insulation resistance, high voltage, balance and magnetic effect. As well as these examinations, the sample tests include vibration, temperature coefficient, climatic and life tests. The apparatus used in the laboratory to measure the out-of-balance of an instrument was designed by a member of the staff and manufactured by the E.I.D. workshops. Defective balance in an electrical indicating instrument is shown by the percentage departure of the pointer from the zero when the instrument is tilted. It is therefore necessary to measure the scale length, movement of the pointer and the orientation of the instrument.



The lamp testing laboratory showing an integrating sphere at the left, and a cap torsion machine on the bench in the foreground



A diesel alternator under test

Magnetic fields external to an instrument will have a marked effect on its accuracy unless precautions are taken to screen the moving system. To test the effectiveness of the screening, the difference of indication is obtained between readings taken with the instrument in the centre of a magnetic field and in a position where no magnetic field is present. This value must be within specification limits. This magnetic effect apparatus was also devised and manufactured by the E.I.D.

Other work carried out by the electrical branch includes functional testing of earth leakage detection devices for hand tools, testing earth continuity and bit temperatures of electric soldering irons, the measurement of leakage current and handle temperatures of domestic electric kettles and testing of domestic switches. The functional test of a universal test bench for electric vehicle equipment is at present being carried out, as well as load and functional tests on aircraft contactors, circuit-breakers, magnetic indicators and low-inertia motors.

The power branch is responsible for technical direction of the inspection of diesel and petrol engine driven generator sets for the Army and R.A.F., electrical rotating machines of all types and sizes and associated control gear for ground and airborne applications. These tests include the checking of the voltage regulation characteristics of a self-regulating alternator by using a cathode-ray oscilloscope with photographic recording.

Testing of generator sets is mostly at full load, but with no load, part load and overload on a prescribed cycle. Tests are run on a daily basis to simulate actual service conditions. At the conclusion of the tests, engines are stripped for examination, measurement, assessment of general condition and photographic record.

The technical service branch provides a service to the whole of the Inspection Directorate in the design and manufacture of the inspection equipment, weights and measures and drawing and printing. Equipment in this branch includes a three-dimensional tape-controlled measuring equipment. This is basically a jig-boring machine with the cutting head replaced by a measuring head.

Other branches of the Electrical Inspection Directorate are the atomic weapons branch, the electronic components branch, the radar branch, the signals branch, the electronic services branch, the metallurgical branch, the packaging branch, the computer branch, the optical branch and the technical records branch.

COAL PLAN REVISED

ONLY two of the National Coal Board's main groups of consumers, electricity and coke ovens, are expected to require more coal in 1965 than they did last year. Demand by the electricity industry is expected to rise from 46·2 million tons to 55 million tons. Overall demand by home consumers is expected to fall from 202·9 million tons in 1958 to 196 million tons in 1965. This will be partly offset by a rise of 5·2 million tons in exports.

Because of these forecasts of lower demand, the National Coal Board is substantially reducing its capital expenditure. According to "Revised Plan for Coal," a policy document published last week by the N.C.B. (price 3s 6d), total capital expenditure at 1955 prices will be £175 million less than was originally estimated for the period 1956-65. Nevertheless, reconstruction will be carried forward in general conformity with the previous programme and by 1965 80 per cent of the output will be coming from reconstructions and new collieries. During the next five years £440 million is to be spent on the 168 major colliery development schemes now in progress, about 90 new schemes and some minor plans for mechanisation, replacement and reconstruction. Well over half the money will be spent in three divisions: the North Eastern, the South Western and East Midlands. The Board is expecting to spend a further £22 million on new processing plants and £49 million on other construction work, including power plants. The new plan is for the production of 200 to 215 million tons in 1965 at a productivity per shift of 30 to 31 cwt, compared with 25·3 cwt in 1958 and 21·5 in 1947.

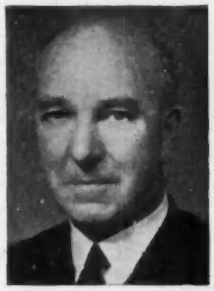
The estimated rise in the demand for electricity generation is based on a big expansion in the use of electricity in industry and the home and on generation at coal-fired stations now being built and planned. Though it does not take into account the possibility of the conversion of some dual-fired stations from oil to coal, the N.C.B. expresses the hope that this will be achieved, with a consequent further rise in the demand for coal for electricity generation.

Transistor Amplifier Monograph

THE 26th in their series of engineering monographs, "Transistor Amplifiers for Sound Broadcasting," by Mr. S. D. Berry, has recently been published by the B.B.C. The applications of transistors to audio-frequency amplifiers used in sound broadcasting are dealt with, the principles followed in the design of such amplifiers being discussed and five examples of various types described and illustrated, with performance details. The operating conditions of d.c. feedback pairs and "super-alpha" pairs are analysed and some numerical evaluations given. Finally, some conclusions are drawn regarding the use of transistors in high performance amplifiers of this nature. The monograph can be obtained, price 5s post free, from B.B.C. Publications, 35, Marylebone High Street, London, W.1.

Economics of Industrial Prosperity

Sir Josiah Eccles' Presidential Address to the A.S.E.E.



Sir Josiah Eccles

IN his presidential address to the Association of Supervising Electrical Engineers on 20th October Sir Josiah Eccles, deputy chairman of the Electricity Council, discussed some of the economic facets of the national industrial situation. He thought that an increasing part of the Association's future activities would be the study of the economic circumstances that influenced industrial prosperity and the translation of these researches into activities beneficial to members and the community. In the past twelve years the demand for our goods had been keen and there had been near-full employment throughout, but some of the forces that produced these circumstances were now nearly spent. World markets for manufactured goods were, however, still expanding and if finance could be arranged there was scope for more trade, but it would be highly competitive.

The steadily rising population of Great Britain could be self-supporting only if sufficient raw materials and natural energy were available. We possessed sufficient coal but inadequate supplies of other fuels, while about half our food and two-thirds of our raw materials were imported, and we had to sell the equivalent value of goods and services abroad to pay the bill. The living standard required could only be achieved if we were able to enhance the value of imported material so that a fraction of the quantity exported in its more valuable form would pay for the whole import.

Selling Abroad

Sir Josiah went on to say that our products had to be as good as those of our competitors in design, performance and price and, above all, the things we offered had to be those that the customer wanted. He thought that the first essential was a constant survey of the existing and potential markets and a reasonable amount of publicity, while science and technology played an important role in enabling us to meet the customer's requirements better. The selling price of exports was conditioned by the price and the amount of the raw material employed, and the relative cost of raw materials to us and to our competitors was significant. Since the seller of raw materials was often the purchaser of manufactured goods, the absolute price should not be beaten down unduly. The labour cost, including salaries and wages at every stage of the process, was an important element and, if wage rates were higher and hours of work lower in one country than another, this could only be balanced by greater output per man-hour in the high-wage, short-week country.

Some favourable wage differential could be sustained by greater mechanisation, more sequence production and shift-working. The social disadvantage of shift-working might be thought to constitute a lowering of the standard of living, but two-shift working should be tolerable and indeed might be unavoidable if we were to remain competitive. Since these remedies were also open to our competitors, Sir Josiah considered that the only permanent solution might be an international convention governing hours and pay rates in competing countries. External overheads included the cost of all external services and the levy imposed upon productive enterprise by local and national Government as rates and taxes, and he thought that the most important of these quantitatively was Government charges.

A major component in successful export trade was deep scientific knowledge and the ability to apply it in the most economical way to produce things people wanted or could be persuaded to want, but he thought that more science and better technology could not themselves keep us competitive, for they were available to our competitors also and it would be presumptuous to assume that we should be more than marginally better in their exploitation. These marginal gains would always have to be weighed against less effective salesmanship, higher wages, shorter hours, lower productivity, poorer organisation, greater overheads and higher rewards to shareholders, and a greater understanding between operatives and management was needed, with a willingness to co-operate in their mutual interest.

Basically, the problem was that of obtaining greater output for a given cost or the same output at lower cost. If the alternative was losing the business to a foreign competitor, and to that extent losing both livelihood and reward on investment, intelligent self-interest should prevail in effecting a solution. Means by which the differing elements in industrial enterprise could be persuaded to co-operate for a common purpose, which included the maintenance of a high living standard, would have to be established.

The requirements in this competitive world were therefore better technology, better organisation and better human relations. Technical education and organised practical training should be made available to an even greater extent than had been practised in the past. If smaller firms could not provide adequate training facilities, training should be organised on a group basis. Competitions for originality of thought and inventions could with advantage be extended.

In conclusion, Sir Josiah said that, though inventive genius and improved technology were of major importance, the matter which would continuously determine living standards was our ability to co-operate, and that the only lasting basis of co-operation was mutual trust. Two things had to be implicit: that if the business was competitive and prospering, the prosperity would be shared by all who had made it possible, and that promotion was open to all on merit alone.

F.B.I. Regional Annual Meeting

The annual general meeting of the London and South Eastern Regional Council of the Federation of British Industries will be held on 19th November. The meeting will take the form of a luncheon at the Café Royal, Regent Street, London, W.1, and Mr. W. H. McFadzean, the president of the F.B.I., will give a talk on the more recent activities of the Federation.

Fall in Gas Sales

FROM the 1958-59 reports of the Gas Council and Area Boards published last week it is clear that the gas industry suffered more from the effects of the industrial recession than the electricity supply industry. This, and the mild weather of the past winter—a graph in the Council's report shows how closely gas consumption follows the mean temperature—were the main factors responsible for a decline of 1·7 per cent in sales during the year. The result was that, for the first time since nationalisation, the industry incurred a deficit, amounting to £1·5 million. This, of course, must be viewed against the industry's total income of £389·6 million and aggregate sales of 2,605 million therms.

There are twelve Area Boards, including one for Scotland, for which the Gas Council is the central body. (In this respect the gas and electricity industries differ, the Electricity Council's responsibility being confined to England and Wales.) The fall in gas sales was spread over all Areas except Wales, where there was an increase of 2·6 per cent. An analysis of sales shows that domestic consumers took 50·23 per cent of the total, industrial users 29·55 per cent and commercial users 15·36 per cent, the balance of 4·86 per cent including public lighting and gas used for the Boards' own purposes. The average income per therm sold was 20·79d compared with 20·17d in 1957-58.

In order to offer gas at a more attractive price to the large domestic consumers, the Northern and Southern Boards introduced two-part tariffs during the year. These were the only tariff changes, but since the end of the year three Boards—the Scottish, North Western and North Eastern—have had to revise their prices in view of the deficits incurred.

The total number of gas consumers at 31st March was 12,923,978, a net increase of 1,781. Domestic consumers increased by 3,858 to 12,177,593. Five Area Boards record small decreases in the number of consumers supplied.

As in the electricity supply industry, sales of domestic appliances were markedly influenced by the withdrawal of hire-purchase restrictions and reductions in purchase tax. The number of gas cookers sold rose by 126,927 to 667,265; water heaters by 41,682 to 197,937; space heaters by 69,701 to 194,060; wash boilers and washing machines by 8,550 to 230,686; and gas-operated refrigerators by 27,878 to 50,031.

Capital expenditure last year amounted to £46·1 million. This was £7·4 million less than the figure approved by the Minister, the underspending being due mainly to the delay or revision of a number of projects for gas-making plant and the slowing-down or deferment of main-laying schemes. Concentration of production in larger and more economic units continued throughout the year and the number of manufacturing stations was reduced from 536 to 463. This was reflected in the further fall in the number of persons employed in the industry, a trend which has been continuous since 1952 when there were 147,937 employees compared with the present 132,576.

New gas-making plant with a total capacity of 107 million cu ft a day was brought into use in 1958-59 and plant with a capacity of 130 million cu ft was scrapped. Of the new plant capacity, 71 million cu ft a day was for the gasification of oil. Experiments carried out in the importation of liquefied natural gas have shown that small shiploads are not economic and consideration is now being given to importing methane on a large scale. Work has also been carried out on the development of new gas-making processes, including the hydrogenation of oil and coal at high pressure.

In the section of the report dealing with organisation and administration, an interesting point of similarity with the electricity supply industry is seen in the statement that the organisation of the South Western Board was simplified by making district managers directly responsible to the area development manager.

Exhibition Facilities

IN January last year the Federation of British Industries set up a committee, with Mr. George Pollitzer as chairman, to investigate the adequacy of exhibition facilities in this country. This committee has now presented its report ("Exhibition Facilities in the U.K.," F.B.I., 21, Tothill Street, London, S.W.1, price 5s) after securing evidence from 42 trade associations, eight leading exhibition organisers and others, including representatives of Earls Court and Olympia.

Thirteen of the associations (including the Association of Supervising Electrical Engineers, the British Electrical and Allied Manufacturers' Association, the British Engineers' Association, the British Plastics Federation, the Mechanical Handling Engineers' Association and the Scientific Instrument Manufacturers' Association) were "not entirely satisfied with present accommodation," although only particular aspects were criticised. Fourteen others (including the Machine Tool Trade Association, the Radio and Electronic Components Manufacturers' Association, the Radio Industry Council and the British Radio Equipment Manufacturers' Association) are put on record as being "not satisfied with present accommodation." The remaining fifteen associations expressed their satisfaction with present arrangements.

The committee comes to the following conclusions:—(1) There is an urgent need for a new exhibition building situated in Central London, with 500,000 sq ft of ground floor space, restaurants, conference rooms, offices and ample unloading yards and car parks. (2) The capital cost, estimated at £10 million, plus operating losses for the first few years, should be met from public funds. (3) The Government, in co-operation with industry, should take immediate steps to improve existing exhibition facilities.

Among supplementary recommendations is a proposal that the Government should issue "directives" to London Transport and British Railways, and local authorities where appropriate, to give greater prominence to the fact that major national exhibitions are in progress and to the route leading to the exhibition hall. It is also suggested that the Customs authorities should be directed to facilitate the entry of exhibits for international shows. More vigorous publicity overseas for trade exhibitions is urged upon the Government.

An annexe to the report outlines a scheme for the possible extension of Olympia by the erection of a multi-storey building over the railway tracks adjoining the present buildings.

VIEWS on the NEWS

By REFLECTOR

LAST week I referred to a company director, mentioned by the *Guardian*, who proposed to purchase from his own works a block storage heater for use in his home. This was made to appear as though it was a means of avoiding purchase tax, but in a letter to the *Guardian*, the director (Mr. M. Liss) says that a wrong impression was given. He is quite willing to pay the tax on the heater, but the Customs and Excise people tell him that he cannot because these heaters are not taxable. His real trouble seems to be that the London Electricity Board refuses to install the necessary equipment to supply him with electricity during off-peak periods, although the Board has a restricted-hour tariff. Mr. Liss says that he is writing again to the Board to see if he can " prod them into action to carry out their obligations."

* * *

Another correspondent of the *Guardian* says that he had happier results two years ago. Presumably on his suggestion, the maker of one type of storage heater approached the Customs and Excise and was told that provided a domestic user paid the purchase tax he could be supplied with a (new) block storage heater. In his case the local manager of the South Eastern Electricity Board agreed that he qualified for an off-peak tariff for the heater and also for water heating. These two cases raise questions. In the first instance, it could only have been held that block storage heaters were not taxable because nobody had supplied them for domestic purposes. The reason for this was that if their limitation to commercial and industrial uses were not observed, all of them, domestic or otherwise, would be taxable at the same rates as other types of electric heaters. How then, in the second case, could H.M. Customs and Excise undertake to distinguish between uses—or make an exception for this particular heater? And what accounts for the different attitudes of the two Electricity Boards?

* * *

Much public interest has been shown in the moving of the Buckingham Palace sentries to behind instead of in front of the Palace railings. Many people do not like it. One of them is a lady who, being " profoundly shocked," writes to *The Times* about it. She thinks a less drastic plan could have been made to protect the soldiers from the public. She says:—

> " Why not an invisible screen, electronic I believe, such as used to protect open rooms and verandahs from insects, and in the open-style zoos between the wild animals and the public? "

After considering the implications of this last phrase, I have tried to imagine the sort of screen the lady has in mind. For one thing insects are much more sensitive than the public (this section of the public anyway) and a great deal more " electronics " would be needed to form an effective screen which, moreover, would have to cover a wide area. An electric fence such as is used to keep cattle within bounds would be cheaper but, here again, cows' noses are more sensitive than intrusive spectators' skins and the voltage would have to be so much higher as to be impracticable. The public would not consent to be " profoundly shocked."

* * *

The Electricity Boards are not the only people who are accused of spoiling amenities. A letter in *The Times* from a resident at Hampstead Garden Suburb complains of " a steel pylon 150ft high with a battery of lights and a platform on top " which overlooks a large part of the Suburb and Hampstead Heath extension. This is the new lighting arrangement which the London Transport Executive has installed for its Golders Green marshalling yard. The writer suggests that 45ft towers could have been used for the job. This, of course, would have meant more towers with a corresponding increase in the possibility of complaints.

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Reporting the inquiry into objections against a proposed 275 kV line from Stalybridge to Stockport, the *North Cheshire Herald* says that

> " the new nylon towers would be 136ft high, spaced about 1,200ft apart, and there would be 50 over the ten miles."

The use of this unusual material suggests an attempt to meet objections.

* * *

The electrical industry with its various branches is in a very healthy state generally. The supply section has recently reported a substantial surplus and even before nationalisation it was doing well. Conditions were very different half a century ago in electricity supply and traction. In fact the *Electrical Review* of 22nd October, 1909, gave a list of ten securities to show that £10,000 invested in them ten years earlier was worth no more than £4,970. For six London electricity supply companies it was shown that £1,000 invested in each had dwindled in value by amounts varying between £324 and £586. The value of £1,000 nominal of British Electric Traction shares (then the company was actually in the traction business) had fallen to £43. Three other electric tramway companies' shares had also depreciated in value, but not quite so badly. The *Review* commented:—

> " If the manufacturing industry had been included, the fall in capital value would have been still greater; but in the course of ten years many new factors have arisen in British electrical manufacturing, and these would have to be taken into account in making a fair study of the matter."

PERSONAL AND SOCIAL

News of Men and Women of the Industry

At the annual meeting of A. C. Cossor, Ltd., on 13th October, **Lord Exeter,** chairman of the company, announced his intention of resigning from the company at the end of the present financial year, in order that he could devote more time to the management of the family estates.

Changes in the English Electric Co.'s organisation in the Eastern Hemisphere will be made in the near future.

Mr. E. C. Fox, B.Sc., A.M.I.E.E., A.M.I.Mech.E., the company's general manager in India, will become managing director of the English Electric Company of Australia (Pty.), Ltd., at the beginning of January, in succession to **Mr. C. W. Goodman,** M.I.E.E., M.Inst.T., M.I.E.(Aust.), who has passed normal retiring age. Mr. Goodman will continue full-time service as chairman of the Australian company. In India, **Mr. N. P. Dingwall,** A.M.I.E.E., former manager of the company's Calcutta office, will replace Mr. Fox as general manager on 1st November, when the latter returns to England for consultations before going to Australia.

Mr. Fox was educated at King's School, Sydney, and Sydney University where he gained his degree. After training with various companies in Australia, he came to England in 1937 to gain experience as a student apprentice in Rugby and London. Returning to Sydney in 1939, he joined the English Electric Co. as technical sales engineer in Melbourne in 1944, and continued in service with the company there, including five years as manager, until his appointment as general manager of the company in India in April, 1956. During the last war he was a captain in the Royal Australian Electrical and Mechanical Engineers, Australian Armoured Division, and a technical liaison officer.

Mr. Goodman was educated at Adelaide University and served as a lieutenant in the Australian Imperial Forces in Mesopotamia in the 1914-18 war. He joined the English Electric Co. in London in 1919 and served with the company in the United Kingdom until 1925, when he returned to Australia where he became general manager. When the company formed a new subsidiary in Australia at the beginning of 1958 he was appointed chairman and managing director.

Mr. Dingwall was educated at Morgan Academy and the Technical College, Dundee. After serving as a craft apprentice in Dundee, he held various posts in erection, supervising and liaison engineering before joining the English Electric Co. as a technical sales engineer in the Export Department in 1945. In 1946 he went to India as technical sales engineer and was appointed acting manager in Calcutta towards the end of 1949. In 1950 he became manager of the Calcutta office.

Mr. E. C. Fox

Mr. C. W. Goodman

Mr. N. P. Dingwall

Sir Leighton Seager, Bt., C.B.E., D.L., J.P., of St. Mellons, Cardiff, and **Alderman T. Evans,** C.B.E., J.P., of Pengam, Monmouthshire, have been re-appointed as part-time members of the South Wales Electricity Board, and **Col. J. F. Williams-Wynne,** D.S.O., J.P., of Towyn, Merionethshire, and **Mr. R. W. Johnson,** of Birkenhead, Cheshire, have been re-appointed part-time members of the Merseyside and North Wales Electricity Board.

Mr. F. W. Cater, A.C.A., has been appointed secretary of the Midlands Electricity Board in succession to **Mr. A. Stephens,** F.C.I.S., M.B.I.M., who has retired from that position on reaching the age of sixty-five. **Mr. C. Wickstead,** F.C.I.S., succeeds Mr. Cater as deputy secretary of the Board.

Mr. Cater held secretarial posts in industry before becoming secretary of the former Midland Electric Corporation for Power Distribution Co., Ltd., and a member of the West Midlands Joint Electricity Authority. Since the formation of the M.E.B. in 1948 he has been its deputy secretary and establishments officer.

Mr. Wickstead joined the Midland Electric Corporation for Power Distribution Co., Ltd., in 1937 and held several clerical posts before becoming assistant secretary. In 1948 he was appointed secretary of the S. Staffs. and N. Worcs. Sub-Area of the M.E.B. Mr. A. Stephens, who will remain on the staff of the M.E.B. to carry out special duties, held secretarial appointments in industry before joining the staff of the Commercial Department of the former Shropshire, Worcestershire & Staffordshire Electric Power Co. in 1927. In 1935 he was appointed personal assistant to the managing director of the company, retaining that post until nationalisation, when he became secretary of the M.E.B.

The first of the revised G.E.C.-Hirst Research Fellowships has been awarded to **Mr. E. Whipp,** B.Sc., of Keighley, Yorkshire. Originally endowed in 1938 by the G.E.C. to commemorate its fiftieth jubilee, the value of the fellowship is some £800 per annum and it is tenable for one year at Birmingham University. It is open to men who have had industrial experience and enables them to return to the University for research work.

Mr. E. Whipp

Mr. Whipp will be engaged in research on non-destructive testing of castings, forgings and metallic objects generally. He graduated in electrical engineering from Birmingham University in 1955, after which he was with the Royal Aircraft Establishment as a scientific officer in the Electrical Engineering Department. He left the R.A.E. at the end of last August to take up his fellowship at Birmingham.

Dr. J. W. Macfarlane, managing director of the Macfarlane Engineering Co., Ltd., Glasgow, left last week on a 30,000-mile business trip to Australia, the United States, British Columbia and Canada. He will visit companies in these countries who have expressed interest in negotiating manufacturing licences. During his stay in Canada, Dr. Macfarlane, who is vice-convener of Renfrew County Council, is to present a replica of that county's coat-of-arms to the County of Renfrew in the Province of Ontario.

Mr. C. Bayliffe, lighting superintendent at Oldham, has been elected chairman of the Lancashire and Yorkshire section of the Association of Public Lighting Engineers, and chairman of the Manchester Centre of the Illuminating Engineering Society.

Mr. L. J. Luffingham, A.M.I.E.E., who, as we have already reported, has retired from the position of public relations officer to the Central Electricity Generating Board, was recently presented with a camera and a port-

Mr. E. J. Turner, secretary of the C.E.G.B., making a presentation to Mr. L. J. Luffingham on his retirement from the Board

able typewriter from his colleagues with the Board. The presentation was made by Mr. E. J. Turner, secretary of the Board.

At the annual dinner of the North West and Merseyside and North Wales Centres of the **Association of Managerial Electrical Executive** on 7th October at the Royal Hotel, Southport, over which Mr. P. H. Flatt presided, Mr. T. E. Daniel, chairman of the North Western Electricity Board, gave an interesting talk on his visit to Canada and America as a delegate to the World Power Conference. Mr. Daniel drew some comparisons between aspects of electricity supply in both countries and those in Great Britain, particularly in relation to distribution and use of manpower. His toast to the A.M.E.E. was responded to by Mr. Flatt.

The reply to the toast of the guests, proposed by Mr. H. Breckell, was given by Mr. W. C. Parker, director of the North West Region of the Central Electricity Generating Board, and by Mr. H. Marriott, president of the A.M.E.E. In the course of his remarks Mr. Marriott announced that Mr. J. W. Thomas was relinquishing his post as secretary at the end of October and that his successor would be Mr. L. J. Luffingham.

Mr. C. H. Flurscheim, B.A., M.I.E.E., M.Amer.I.E.E., a director and the chief electrical engineer of the Metropolitan-Vickers Electrical Co., Ltd., has been co-opted to serve on the Council of the British Welding Research Association.

The Nottingham Branch of the **Electrical Association for Women** held its 21st birthday dinner on 30th September, when the toast of the Association and the Branch was proposed by Mr. C. R. King, chairman of the Electricity Council, and the response was made by Miss Mary George (director, E.A.W.). A combined toast to Mrs. E. Donaldson, founder member, and the first and present president, Mrs. A. B. Lewis, was proposed by Mrs. A. L. Hayes, area organiser, to which Mrs. Lewis replied. Mrs. E. B. Phillips, chairman, proposed the toast of the guests, to which the reply was given by Mr. W. G. Jackson, director of education.

Mr. C. Glover, until recently sales manager of the United Insulator Division of the Telegraph Condenser Co., Ltd., has been appointed general manager of the Division. He is succeeded as sales manager by **Mr. B. E. J. Honey,** who had been with the R. H. Symonds group of companies for thirteen years.

Mr. P. D. Canning, of the Plessey Co., Ltd., has been appointed chairman of a new sub-committee, 12-7, formed by the International Electrotechnical Commission to deal with climatic and durability testing of telecommunications equipment.

Mr. D. J. Philpot has been appointed field sales manager of Morphy-Richards, Ltd. **Mr. R. M. Morgan** continues in the capacity of Morphy-Richards sales manager, while **Mr. D. C. Richards** continues as Astral sales manager.

Mr. A. Laird has relinquished his post as a technical officer with the Combustion Engineering Association to take up another appointment. **Mr. T. G. Edmondson** has succeeded him as a technical officer.

The North Western Branch of the **Electrical Trades' Commercial Travellers' Association** held its annual luncheon on 15th October, at the Lancashire County Cricket Club Pavilion, Old Trafford. The guest speaker, Alderman L. Lever, M.P., made a witty speech in proposing the toast to the Association and praised the work being done for charity, and in his response Mr. S. E. R. Barker, national chairman, said how pleased he was at the progress made by the branch in the few years it had been in existence.

Mr. G. P. Humphry, branch chairman, proposed the toast to the guests and Mr. W. B. Sidebotham, president, Manchester Radio Industries Club, replied. The charity appeal was made by Mr. C. J. S. Roberts, branch charity steward, and a collection realised the sum of £31 for the Sam Johnson Memorial Fund.

Mr. O. W. J. Farmer has been appointed group publicity manager with collective responsibility for publicising the products of the A.E.I. Divisions and subsidiary companies managed by the British Thomson-Houston Co., Ltd. These include the heavy plant, motor and control gear and electronic apparatus divisions, Birlec, Ltd., and the A.E.I. Lamp & Lighting Co. Mr. Farmer joined A.E.I. immediately after the war as assistant manager of the Lamp and Lighting Publicity Department

Mr. O. W. J. Farmer

Mr. R. E. Hopkin

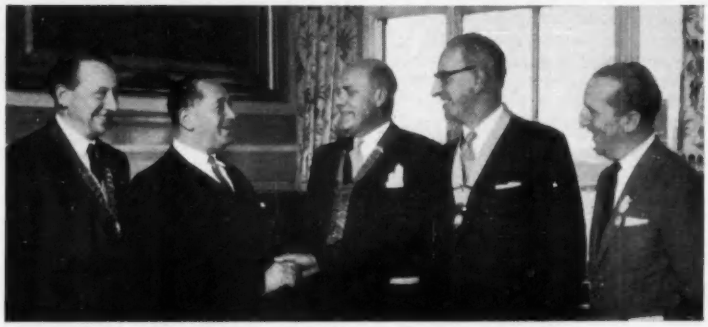
(B.T.H.) and was appointed manager of that department (now A.E.I. Lamp and Lighting Publicity Department) in 1952. His office will be at Crown House, Aldwych, London, W.C.2.

Mr. Farmer has been succeeded at the A.E.I. Lamp & Lighting Co. by **Mr. R. E. Hopkin,** who joined A.E.I. in 1954 to take over the Exhibitions and Display section.

The Lamp and Lighting Sales Departments of the A.E.I. Lamp & Lighting Co., Ltd., have been integrated and at the same time a combined Lamp and Lighting Marketing Department has been set up. The following appointments have been announced:—**Mr. H. G. Lilley,** sales manager, and **Mr. W. C. Huston,** marketing manager.

Mr. Lilley became manager of the

At the annual luncheon of the North Western Branch of the Electrical Trades' Commercial Travellers' Association. Left to right: Mr. P. M. King, Birmingham chairman, Alderman L. M. Lever, M.P., Mr. S. E. R. Barker, national chairman, Mr. G. P. Humphry, branch chairman, and Mr. F. Foulkes, branch vice-chairman



Mr. H. G. Lilley

Mr. W. C. Huston

Lighting Sales Department in January last year. He joined the B.T.H. Co. in 1935 and opened the B.T.H. Cambridge depot in 1936. He was manager of this depot from 1936 to 1955 except for a period in the Royal Artillery from 1943 to 1946, and was appointed assistant regional manager (lighting) of the Midland region of the A.E.I. Lamp & Lighting Co., Ltd., in 1955.

Mr. Huston was manager of the B.T.H. Lighting Department from 1940 to 1949, when he became manager of the B.T.H. Lamp Sales Department. He took over the management of Lamp Sales for the A.E.I. Lamp & Lighting Co., Ltd., in 1955. He was chairman of the Electric Discharge Lamp Auxiliaries Council from 1949 to 1954. Mr. Huston was appointed a director of Claude General Neon Signs in 1951 and for many years has been a director of the British Colour Council.

Mr. C. H. W. Clark, Ph.D.(Eng.), who writes in this issue on "Radio Interference from High Voltage Insulators," graduated at Queen Mary College, University of London, and obtained the degree of Ph.D.(Eng.) for research in the high voltage laboratory there. He is now chief high voltage engineer with Steatite & Porcelain Products, Ltd., and is a member of various committees of the Electrical Research Association, the British Standards Institution and the International Electrotechnical Commission dealing with the testing and standardisation of high voltage insulators.

Dr. C. H. W. Clark

The annual ball of the **Ipswich and District Electrical Association** will be held on 6th November at the Royal Hotel, Clacton-on-Sea.

The **G.E.C. Golfing Society** held its annual meeting recently at the Sonning Golf Club, Sonning-on-Thames. There was an entry of 70 players competing for the various awards, including Sir Leslie Gamage, chairman of the company, Mr. R. E. Robinson, an assistant managing director, and Mr. R. C. Giggins and Mr. W. J. Bird, both directors of the company. The prizewinners were as follows:—Messrs. T. Purcell (Manchester), M. Toogood (Southampton), J. Scott (Newcastle), F. J. Thompson (Brighton), H. E. Carmody (London), H. S. Dupin (London), D. C. Ball (London), D. C. Ball and B. M. Furness (London), C. Griffin and V. Winnett, and F. F. Newlands (Claude-General Neon Lights, Ltd.).

Mr. R. A. Turpin has been appointed manager of the Exeter branch, at 40, Whipton Village Road, Whipton, of British Insulated Callender's Cables, Ltd., on the retirement of **Mr. H. F. G. Bicker.** Mr. Turpin joined B.I.C.C. in 1949 as a representative at Exeter. He was recently appointed hon. secretary of the Exeter and District Branch of the Electrical Industries Benevolent Association.

Mr. R. A. Turpin

Mr. Bicker joined the London office of Callender's Cable & Construction Co., Ltd., in 1913, where he remained until 1922, apart from Army service during the 1914-18 war. He was then appointed representative in Devon and Cornwall and subsequently became the first manager of Exeter branch in 1926. He is a founder-member and past-president of the Exeter Electric Club and was for several years branch treasurer of the Electrical Industries Benevolent Association.

Nearly six hundred were present at the annual staff dinner of **W. T. Henley's Telegraph Works Co., Ltd.,** and its associated companies, held at the Dorchester, London, W.1, last Saturday. After dinner the toast of "The Henley Companies" was proposed by Mr. F. V. Vaissiere (assistant general manager), who referred to the acquisition of the companies by Associated Electrical Industries, Ltd., and said that while some changes were inevitable there would be great opportunities for Henley people within the organisation. In responding, Sir Alexander Sim (chairman) also mentioned the "take-over" and the projected closing of the North Woolwich works. He said that everything possible would be done to find alternative positions for those employed at the works. The toast of "The Ladies" was proposed in a witty fashion by Mr. W. H. Lythgoe (assistant chief engineer) and Miss C. T. Daniel (Birmingham branch) made a spirited reply. The subsequent entertainment included a prize draw, a cabaret and dancing.

Mr. F. V. Vaissiere, assistant general manager, W. T. Henley's Telegraph Works Co., Ltd., proposing the toast of the company. To the right are Mr. W. H. Lythgoe, assistant chief engineer, who later proposed the toast of "The Ladies," and Mr. G. H. Squire, manager of Henley's Southampton branch

The next production of the **Portland Players** (Central Electricity Sports and Social Club) will be "Bonaventure," by Charlotte Hastings, which will be given on 9th and 10th November at King George's Hall, Adeline Place, Great Russell Street, London, W.C.1.

Mr. A. J. Moss has been appointed personnel officer of the British Electric Transformer works at Hayes, Middx., of Crompton Parkinson, Ltd. For the past thirteen years he has been staff personnel officer at the group's central personnel office in London. He is succeeding **Mr. D. Rae,** who will be taking over other responsibilities at the works.

Mr. H. L. Madeley, production manager with Hoover, Ltd., Perivale factory group, has completed twenty-five years' service with the company, and Mr. S. Roberts, managing director, recently presented him with a gold watch.

Mr. K. Druce, D.F.H., A.M.I.E.E., has been appointed sales manager to the English Electric Co. of South Africa (Pty.), Ltd., and will join the staff in the Johannesburg office. For the past two years he has been manager of the company's Bristol office, responsible for the South-Western area, where he will be

Mr. K. Druce

Mr. W. M. Todd

succeeded by **Mr. W. M. Todd.** After wartime service in the R.N.V.R., Mr. Druce joined the English Electric Co. at Stafford. In 1949 he transferred to the London office as senior engineer and was responsible for the liaison work with the Admiralty and other Service Departments until he went to Bristol in 1958.

Mr. Todd joined the company in Glasgow in 1936. In 1948 he transferred to the Cardiff office where he was technical representative for the area, until he was promoted manager of the company's Edinburgh office in 1955.

Mr. L. E. Mather, C.B.E., is retiring from the board of Mather & Platt, Ltd., at the end of March next year and he will be succeeded as chairman of the company, as from 1st April, by **Mr. W. L. Mather,** O.B.E., M.C., T.D., M.A.

Mr. L. E. Mather has been on the board of Mather & Platt since 1908 and became chairman in 1916. Mr. W. L. Mather has been a director of the company since 1947. He is also a director of Rustyfa, Ltd.

Mr. H. G. Hulme, field sales manager of Hoover, Ltd., has retired after thirty-seven years' service with the company. A dinner was given in his honour at the Savoy Hotel, London, by Mr. S. Roberts, managing director, at which presentations were made; at earlier meetings presentations were also made from directors and colleagues.

Mr. R. Tearse, A.M.I.E.E., has joined Volex Electrical Products, Ltd., in charge of a newly-formed Technical Department for the development and sales of special cables, primarily for space-heating. Mr. Tearse was for a number of years with British Insulated Callender's Cables, Ltd.

The **Association of Supervising Electrical Engineers** announces that all tickets have been sold for its Christmas gala ladies' evening at the Connaught Rooms, London, on 19th December.

In presenting the "Paragon," by Roland and Michael Pertwee, this week at the Cripplegate Theatre, London, E.C., the **G.E.C. Dramatic Society** did well with a rather difficult play. The theme is the ultimate shattering of a myth created for himself by a forceful blind father whose son ostensibly died heroically in the war but was actually a deserter and an extremely bad character. Douglas Fairweather played the part of Sir Robert Rawley, the father, with conviction, and he was well supported by Anna Powell (as his second wife), Gill Champion (the son's "widow"), Laurie White (her second husband), Norman Waight (the Earl of Clarendon), Nigel Steeley (the erring son) and William Bulline, Shirley Munn and Ann Rawnsley in the lesser roles. The production was by Florence Scantlebury. A donation from the proceeds is being given to the Leavesden Hospital for mentally-handicapped children.

Scottish Cables, Ltd., announces that **Mr. J. S. Hastie,** B.Sc., M.I.E.E., has been appointed works director of

Mr. J. S. Hastie

Mr. J. T. Henderson

the Renfrew factories. **Mr. J. T. Henderson,** B.Sc., Dipl. R.T.C., A.M.I.E.E., succeeds Mr. Hastie as technical manager.

Mr. J. W. Ashley, B.Sc., chief engineer of Atomic Power Constructions, Ltd., since the inception of the company, has been elected to the board as technical director.

The B.E.A.M.A. Council entertained **Sir Henry Self** to luncheon at the Connaught Rooms, London, on 15th October to mark his retirement from the chairmanship of the Electricity Council. Mr. W. K. G. Allen, chairman of the B.E.A.M.A. Council, presided and presented Sir Henry with a tape recorder. Mr. Allen mentioned some of the highlights of Sir Henry Self's career, and referred to the fine team that Sir Henry and Lord Citrine had made in the supply industry. In reply, Sir Henry referred to his happy association with the electrical industry, and said that in his retirement he hoped to write books, and for this the tape recorder would be very helpful.

Sir Henry Self (left) receiving a presentation from Mr. W. K. G. Allen, chairman of the B.E.A.M.A. Council

OBITUARY

Mr. Joseph Lindsay, M.B.E., former chief erection engineer in the Rotating Plant Department of Bruce Peebles & Co., Ltd., Edinburgh, a post he held from 1948 to 1958, died on 16th October. He had spent nearly fifty years with the company, which he joined in 1910 as an apprentice. One of the pioneering engineers of hydro-electrical development in the Highlands, Mr. Lindsay had supervised the erection of generators throughout the North of Scotland Hydro-Electric Board's area. Between 1924 and 1927 he carried out work for his company in China, Korea and Japan.

Dr. B. van der Pol, the well-known Dutch radio and telecommunications engineer, died on 6th October at the age of seventy. He studied under Prof. J. A. Fleming at University College, London, and later went to Cambridge where he worked with Sir Joseph Thomson at the Cavendish Laboratory from 1917 to 1919. He returned to Holland in 1919 and in 1922 became physicist in the research laboratory of N. V. Philips works at Eindhoven, later becoming director of research in radio science.

Mr. James Barcroft Hudson, A.M.I.E.E., former borough electrical engineer and manager to the Leigh (Lancs.) Corporation, died on 9th October at the age of eighty-one. Mr. Hudson entered the service of the Bootle Corporation in 1900 and later became deputy borough electrical engineer. He went to Leigh in 1917 and was borough electrical engineer there until he retired in 1946.

Mr. Ernest Melville Packham, secretary of the Eastern, London and South Eastern Region of the C.E.G.B., died on 7th October.

Mr. T. E. Goldup.—Arrangements have been made by the Council of the Institution of Electrical Engineers for a memorial service to the late Mr. T. E. Goldup, a past-president of the Institution, to be held at 11.30 a.m. on 28th October at the Queen's Chapel of the Savoy.

The New Cabinet

The Prime Minister announced last week some of the changes he has made in the Cabinet of the new Parliament. These include Lord Hailsham, Q.C., who becomes Lord Privy Seal (Minister for Science and Technology), Mr. Reginald Maudling, President of the Board of Trade, and Mr. Ernest Marples, Minister of Transport. Lord Mills, former Minister of Power, becomes Paymaster General. The appointment of the new Minister of Power had not been announced at the time of going to press.

LETTERS TO THE EDITOR

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Electricity and Fire Risks

I HAVE just seen the article by Mr. D. J. Bolton in your 28th August issue headed " Electricity and Fire Risks—Misleading Deductions in Fire Research Publication " and this seems to call for comment.

The section of the publication concerned is the report of the Director of Fire Research, not the report of the Fire Research Board as Mr. Bolton states. It is true that the rate of incidence of fires of electrical origin measured in terms of the electrical energy generated has been somewhat lower (one fire per 15 million kWh instead of one fire per 10 million kWh) during the last year and the further point was made in the report that *it was too early to say whether the change in the rate of incidence of fires for electrical apparatus is indicative of a decreasing trend or merely a chance fluctuation.* Mr. Bolton would be wrong to assume at this stage on the evidence available that the relation established over the last ten years had broken down.

Mr. Bolton also says that the increase of electrical fires with the electrical energy generated is no more significant than the increase in the incidence of cancer, telephone calls or road accidents. Here he neglects the fact that there is reason to believe that electrical fires depend on the generation of electrical energy. This point has been covered by a paper by J. F. Fry and myself.*

I am not quite clear what Mr. Bolton is referring to when he says that " the authors' nerve failed them when it came to applying the coefficient to electrical risks " for the figures are stated quite plainly in the report. It was also stated that the fires have been compared on a basis of equal calorific values of the fuels.

Mr. Bolton does not like the idea of trying to predict ahead and infer the number of fires likely to occur in the future. This seems to me a very necessary operation unless we are to become complacent in the face of an ever-growing danger. The Joint Fire Research Organisation has concluded a detailed survey of all the fires of electrical origin during 1958 and the results are at present being analysed with, I hasten to add, due " regard for statistical disciplines."

Boreham Wood. D. I. LAWSON,
Director,
D.S.I.R. and Fire Offices Committee,
Joint Fire Research Organisation.

Mr. Bolton has seen this letter and replies as follows:—

(1) The publication under review contained the report of the Fire Research Board followed by the report of the Director of Fire Research. All the technical matter was in the latter section, but there was no reason to suppose that the Board dissociated itself from any of the conclusions therein.

(2) Obviously, electrical fires depend on the generation of electrical energy. If there was no electricity there would be no " fires of electrical origin," just as if there were no roads there would be no road deaths. But this is a very different thing from saying that for every ten million units of electricity there will be one electrical fire. I agree that it might be useful to predict the number of fires likely in ten years' time, but it would be far more useful to devise some means of falsifying the prediction.

(3) If the fire risk from a type of apparatus is proportional to the heat content of the fuel burnt therein (a preposterous assumption if ever there was one) then, from figures given in the table, the risks from kerosene are three times and those from electricity are seven times those from coal and coke. The report actually states the former in words, but when it comes to electricity it merely says " The fire hazard of electricity appears, on this basis, to be greater than that of any of the other means of obtaining heat." I therefore concluded that before pushing his figures to their logical conclusion the author had lost his nerve—as well he might.

(4) It is indeed good news that in the analysis now being made there will be " due regard for statistical disciplines." The emphasis is on the " now."

* D. I. Lawson and J. F. Fry. " Fires of Electrical Origin." I.E.E. *Proceedings*, 1957, 104 (Part A) (14), 185-91.

Nuclear Power Plant for Japan

DURING the past two weeks meetings have been taking place at Erith, Kent, between members of the G.E.C. Atomic Energy Division and the Japanese Core Structure Study Group. These meetings have now been satisfactorily concluded and a report has been submitted to the Japan Atomic Power Company in Tokyo. The object of these talks was to continue discussions held last August in Tokyo, and to compare the results of investigations carried out independently by the G.E.C. and J.A.P.C. on a revised design of earthquake-proof graphite core for the 150 MW nuclear power station proposed for Tokai-Mura, 70 miles north-east of Tokyo. Full details of the original design of the plant were published in the *Electrical Review*, 17th April, 1959.

The investigations have shown that seismic loads will be distributed smoothly throughout the core and that the maximum force that could be experienced by any one of the graphite bricks is far below the breaking point. The original core structure submitted to J.A.P.C. was designed to accommodate dimensional changes due to thermal expansion and " Wigner growth " and at the same time to withstand any conceivable earthquake hazard. Later experimental data confirmed, however, that at high temperatures and after long neutron irradiation a shrinkage occurs in the graphite. It had been appreciated that such shrinkage would give rise to the possibility that under extreme conditions of emergency the outer part of the core might be held tightly together while the inner part could become loose. Studies had therefore already been commenced on various ways of overcoming this.

The G.E.C. core design on which agreement has now been reached meets all the requirements without involving any loss of power output. The core is constructed solely of layers of graphite bricks, the bricks being basically hexagonal in section but keyed to each other in such a way that they remain fixed together in their correct relative positions under all possible conditions of expansion or contraction. A supporting structure surrounds the cylindrical core, serving to prevent the layers moving relatively to each other even in the event of a severe earthquake.

Discussions have been continuing in Tokyo on certain outstanding commercial aspects, and present indications are that the contract will be ready for signing towards the end of November.

INDUSTRIAL NEWS

E.D.A. Sales Conference

A simple exhibition designed to give manufacturers an opportunity of demonstrating their latest models of domestic appliances and associated apparatus is being arranged in conjunction with the 1960 E.D.A. sales conference, which will be held at the Royal Hall, Harrogate, from 8th to 11th March. The exhibition will be staged in buildings adjoining the Royal Hall and it will be open to delegates only.

Steelworks Electrical Plant

Electrical plant valued at £325,000 and comprising four 2,000 h.p. d.c. motors and twenty-two mercury arc rectifiers will be supplied by the Heavy Plant Division, Rugby, of Associated Electrical Industries, Ltd., for a new 56in, 3,000 ft/min reversing cold strip mill at the Shotton Works, Flintshire, of John Summers & Sons, Ltd.

Two d.c. motors, each rated at 2,000 h.p. 171/478 r.p.m. 750 V, will drive the mill, and a similar motor will drive each of the two winding reels. Each driving motor for the mill rolls is supplied from a bank of four rectifiers. To maintain constant tension at all times, each reel motor is fed from a pair of cross-connected convertor banks, one of which provides the power for coiling and acts as an invertor during uncoiling. The other convertor bank is loaded for deceleration during coiling, when the convertor acts as an invertor, and during acceleration of the reel for uncoiling, when rectification is required.

Mobile Railway Schools

A mobile school for training new entrants to the Signal Engineer's Department recruited under the London Midland Region's accelerated modernisation plan is now operating in the Euston area. Early next year the school will tour the country to provide technical education on basic signalling principles to signalling staff. The syllabus will provide facilities for new recruits, promotional grades and refresher courses. The school is a two-coach unit, one coach fitted with a range of both operating and static electrical and mechanical signalling apparatus, and the other equipped for lecturing.

Interior of the equipment coach

"Packaged" Power Stations

Five leading British engineering companies announced on Tuesday that they have joined together in a new consortium—Power Construction, Ltd.—to design and construct "packaged" power stations in any part of the world. The companies are: Armfield Hydraulic Engineering Co., Ltd., Belliss & Morcom, Ltd., Cory Brothers & Co., Ltd. (a member of the Powell Duffryn Group), Lancashire Dynamo Holdings, Ltd., and the Mitchell Engineering Group, Ltd. It is stated that the consortium will take advantage of the modern trend of small power stations being ordered as a unit rather than separate contracts being given for different aspects of the job.

Overseas Publicity for A.S.E.E. Exhibition

An appeal to electrical manufacturers to help the organisers of the Electrical Engineers (A.S.E.E.) Exhibition in their efforts to attract more visitors from overseas was made by Mr. R. F. Mathieson, chairman of the exhibition company, at the first showing in London last week of the film of this year's exhibition, "Electrical Shop Window of 1959."

The meeting also marked the beginning of a world-wide publicity campaign, but according to Mr. Mathieson the organisers had much difficulty in obtaining from exhibitors information on what they would be showing. Many of the exhibitors, he said, "look on the exhibition as an occasion for five days highly concentrated selling but if we are given the opportunity then these five days can become the culmination of many months of active publicity throughout the world." If they could tell their overseas contacts about the equipment they might see, many more would be encouraged to visit the exhibition. Success overseas would only come to those who p l a n n e d ahead. Bookings for next year's exhibition already amounted to several thousand square feet more than last year. The special feature, Marine Electrics, would make particular reference to the new P. & O. liner s.s. *Canberra*, which would be the largest passenger ship to be powered entirely by a.c.

In view of Mr. Mathieson's earlier remarks it is unfortunate that the film of the exhibition does less than justice to what was undoubtedly a brilliant and stimulating show. Though attractively photographed in colour, too much time is devoted to the opening ceremony and to the association's own stand and not enough to conveying an adequate impression of the exhibition as a whole and of the range and quality of the equipment on show. The printed prospectus is a more forceful piece of propaganda.

Sir Leslie Gamage (G.E.C.) with Mr. J. H. K. Pendry, immediate past-chairman, A.S.E.E.

Turbines for Gas Board

W. H. Allen, Sons & Co., Ltd., have received an order from the Warwickshire Division of the West Midlands Gas Board for the supply of two 175 kW c.m.r. back-pressure single-stage steam turbines for direct coupling to Electric Construction Co. alternators for installation in the retort houses at Foleshill Gas Works, Coventry.

Industrial Maser Amplifier

A maser amplifier—microwave amplification by stimulated electromagnetic radiation—is now operating at the Mullard Research Laboratories at Salfords, Surrey. The construction of the amplifier, in co-operation with the Royal Radar Establishment, Malvern, and an investigation of its properties and performance, has been carried out in the Laboratories' solid state physics division, where considerable work is being done on semiconductor effects at low temperatures. These amplifiers are a recent develop-

ment and employ the natural oscillations of the paramagnetic ions in certain crystalline substances, for example ruby. They are capable of amplifying very weak radio signals without producing unwanted powerful interference signals, and one successful application in radio astronomy is the amplification of signals from distant radio stars. The Mullard amplifier operates at a wavelength of 10 cm in the "S" band and at a temperature of 1·7°K (approximately −271°C).

Electronics Building at Bangor

Last Monday Sir Willis Jackson, President of the I.E.E. and director of research and education, Metropolitan-Vickers Electrical Co., Ltd., opened a new building for the Department of Electronic Engineering of the University College of North Wales, Bangor. Sir Willis, in his speech, pointed to the need for specialists to be aware of other people's problems. The principal, Dr. C. Evans, said that arrangements had been made for science students of the College to hear lectures from heads of the Arts Department. The new building, which has cost £100,000, will accommodate 120 students.

Direct Generation of Energy

Two teams are being formed by the Central Electricity Generating Board to study the possibilities of large-scale generation of electricity by direct processes not involving rotating machines. One team will study low temperature plasmas and magneto-hydrodynamic methods, the other team thermionic methods. Initially the teams, for which the Board is seeking physicists, electrical engineers and physical chemists, will examine the scientific and commercial feasibility of these schemes, and they will then be responsible for experimental work up to the prototype stage. The work will be carried out "in London or a laboratory near London."

Manufacturers More Optimistic

A further encouraging sign that the boom is working its way through to a wider section of industry is provided by the inquiry into industrial trends made by the F.B.I. at the beginning of the month. Its most interesting feature is the upward move in the plans for spending on plant and machinery, the downward trend having been checked in June. The latest Board of Trade figures, which are based on earlier information and compiled from different sources, indicated that manufacturers' expenditure on plant and machinery would fall by 10 per cent next year after running during the first six months of this year at about 10 per cent below the 1958 level.

The expansion has not been uniform. Larger firms seem to be increasing output more rapidly than small ones, with the engineering and vehicle industries leading the way. In contrast to all the earlier inquiries the number of firms finding it more difficult to get labour is greater than the number finding it easier. There has also been a significant fall in stocks of finished goods. The main basis for future optimism is the continuing increase in orders, both home and export, and the lengthening order books.

Prices of Materials

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

ALUMINIUM ingots	ton £180 0s 0d
COPPER, H.C. Electro	ton £236 10s 0d
Fire Refined 99·70%	ton £235 0s 0d
Fire Refined 99·50%	ton £234 0s 0d
COPPER Tubes ..	lb 2s 3½d
Sheet	ton £265 0s 0d
H.C. wire and strip ..	ton £285 5s 0d
LEAD, English ..	ton £70 5s 0d
Foreign	ton £69 0s 0d
MERCURY	flask £72 0s 0d
TIN, block (English) ..	ton £793 10s 0d
ZINC, G.O.B. Foreign	ton £92 15s 6d
BRASS Tubes (solid drawn)	lb 1s 10½d
Wire	lb 2s 8½d
PHOSPHOR BRONZE Wire	lb 4s 1d
PLATINUM	oz £28 10s 0d
RUBBER, No. 1 R.S.S. spot	lb 32½d—33d

Smaller Euratom Programme

The opportunities for exports of nuclear power stations to Europe are further deflated by the latest reports from Euratom (European Atomic Energy Community). The original Euratom programme published in 1957 was for the completion by 1965 of nuclear power stations totalling 15,000 MW and costing £1,600 million. This was revised to 4,000 MW earlier this year in the second general report of Euratom but it is now considered unlikely that an installed capacity of more than 2,100 MW will be achieved by the target date at a cost of between £220 and £250 million.

This 2,100 MW programme includes the 150 MW station at Latina, Italy (being built by the Nuclear Power Plant Company), the 1,000 MW of stations to be built under the U.S.-Euratom agreement, 400 MW of French plant and a 500 MW German programme. The main uncertainties lie in the likely failure of the U.S.-Euratom programme to meet its target and the lack of firm German plans. Proposals due to be submitted this week by United States companies cover five nuclear power stations with a total capacity of 750 MW. They are the S.E.N.N.-American General Electric project in Italy; a station in Holland; one in Berlin; and one on the Franco-Belgium border.

Apart from over-optimism, the Euratom programme has suffered from the coal crisis in the Benelux countries, the easing of oil supplies and the attitude of France. At present all the firm Euratom projects involve collaboration in projects being carried out primarily for the benefit of an individual country. These include the high-temperature gas-cooled reactor ("Dragon" project) at Winfrith Heath, the boiling heavy water reactor in Norway, and experimental reactors in Holland and Italy. Officials from Euratom have also been visiting the fast-breeder reactor project at Dounreay with a view to possible collaboration. Agreement has been reached for the French Atomic Energy Commission to undertake thermo-nuclear research, and a Euratom research centre is to be formed at the Italian establishment near Milan.

Switchgear Developments

Following a policy of personal contact, South Wales Switchgear, Ltd., has held a number of cocktail parties in many parts of the country in order to discuss with leading personalities in the electricity supply and consumer field new developments in switchgear, transformers and ancillary equipment. The most recent of these conversaziones was held at the Midland Hotel, Manchester, on 14th October. Mr. A. J. Nicholas, managing director, together with a team of technical experts, acted as hosts and discussion revolved around the new 132 kV low oil content circuit-breaker and the 33 kV 1,000 MVA package switchgear developed for both urban and rural electrification schemes. Models of these were on display as well as one of the new transformers which, in design, is a departure from the traditional method of cooling and has already attracted considerable attention. Many small parts were also shown in the form of an attractive display.

Works Visit

Members of the Electrical Contractors' Association, Bath, spent an interesting day at the works of the Simplex Electric Co., Ltd., Oldbury, Birmingham, on 14th October. They were welcomed by Mr. G. D. Mason, general sales manager, after which Mr. G. V. Donaldson gave a short talk on illumination engineering design and application. The party were then conducted round the main factory, foundry, and conduit tube mills to see the manufacture of some of the company's products.

Industrial Films

A folder has been issued containing literature describing the range of industrial films available on free loan from the British Electrical Development Association, 2, Savoy Hill, London, W.C.2.

Electronics Premiums

The scheme for awarding annual premiums for articles on electronics, organised in the past by the Radio Industry Council (London), is now under the joint sponsorship of the Council and of the Electronic Engi-

Mr. A. E. Page, chairman of the British Lighting Council, talking to chief commercial officers of the Electricity Boards when they visited the Lighting Demonstration Centre in London on 15th October

neering Association. Articles published during 1959 will be considered by the panel of judges early in the new year, and explanatory leaflets can be obtained from the Electronic Engineering Association, 11, Green Street, London, W.1, to whom also eligible articles should be submitted before the end of the year. Six premiums of 25 guineas are offered.

Fuel Economy Conference

The Combustion Engineering Association is holding a conference on fuel economy through automatic operation on 3rd and 4th November at the Royal Hotel, Scarborough.

Engineering Production and Orders

Production in the engineering and electrical goods industries in June is estimated by the Board of Trade to have been 2 per cent more than in June, 1958. This increase over last year is smaller than in May but it brings the volume of production in the second quarter to 6 per cent more than in the corresponding period of 1958. The expansion is largely attributable to the increased production of consumer goods. Though falling seasonally in July, production was 9 per cent more than a year earlier and in August it is estimated to have been "a little more than in August, 1958." The index for electrical engineering production for the second quarter of this year was 135, compared with 119 a year earlier and 142 in the fourth quarter of 1958.

The total volume of exports of the two industries, after falling in the first quarter, rose in the second quarter to 5 per cent more than a year earlier. Index numbers for orders on hand, mainly orders for capital goods and components, indicate that orders ceased shrinking in March. After the slight fall in July, orders are expected to have regained their June level by the end of August. The table below shows that the value of deliveries of most of the main electrical engineering product groups was less than a year ago, the striking exception being domestic appliances which increased by over 50 per cent.

DELIVERIES OF MAIN ELECTRICAL ENGINEERING PRODUCTS

	First quarter 1958	First quarter 1959
	(£ million)	
ELECTRICAL MACHINERY—		
Rotating electrical machines	28·5	27·0
Transformers for lighting, heating and power	11·0	10·3
Switchgear and control gear	27·2	26·7
Other electrical machinery	4·0	3·5
INSULATED WIRES AND CABLES	29·4	30·1
OTHER ELECTRICAL GOODS (except radio, telecommunication and other electronic apparatus)—		
Domestic electrical appliances	19·8	30·4
Electrical equipment for motor vehicles, cycles and aircraft	13·9	13·2
Primary batteries	2·9	3·0
Secondary batteries (accumulators)	5·6	5·0
Electric lamps	4·5	5·0
Other electrical goods	15·6	16·9

An explanation of these new statistics and the figures for each of the quarters for 1958 were published in the *Electrical Review*, 15th May, 1959.

Mine Winders for South Africa

Two 5,200 h.p. a.c. winders, the largest of their kind, are to be supplied by Associated Electrical Industries (Heavy Plant Division) to two South African mining companies. One is for the Stilfontein Gold Mining Co.'s Scott shaft and the other for the Western Reefs No. 4 shaft of the Anglo-American Corporation (South Africa). Both winders will have the A.E.I. system of dynamic braking, in which the field of a rotary exciter is controlled by a transductor. Each of the installations consists of a twin-motor drive controlled by a liquid resistance.

The orders were placed with A.E.I. Export, Ltd. Vickers-Armstrongs (Engineers), Ltd., designed the mechanical part of each winder, which will consist of a drum 16ft in diameter, with two compartments, both clutched. Each compartment will be 6ft wide and will accommodate four layers of rope. The Vanderbijl Engineering Corporation is to manufacture this part of the equipment.

Wood Pole Preservation

A 16 mm colour film has recently been made by the Bowthorpe Electric Co., Ltd., Crawley, Sussex, to show the complete process of wood pole preservation by the Bowthorpe method. The film is available for free showing and applications for loan should be made to the company's Sales Department.

Contract Price Formulæ

The British Electrical and Allied Manufacturers' Association has issued the figures for its contract price adjustment formulæ. In each case the rate of pay for adult male labour at 16th October is deemed to be 196s. The "costs of materials" figures are: For electrical machinery and equipment the Board of Trade index figure published on 16th October is 178·7 (1949=100) and 115·2 (1954=100); both figures are provisional. For turbo-generating and allied plant: Materials used in mechanical engineering industries 186·9 (1949=100) and 124·4 (1954=100); both figures are provisional. Blast furnaces and iron and steel melting and rolling (40 and 41) 188·7 (1949=100) and other steel goods, excluding tubes (311 and 312), 128·6 (1954=100); both figures are provisional. The price of ¾in o/d 18 s.w.g. brass condenser tubes (*Metal Bulletin*, 16th October) is 47½d per lb.

Licensee Agreement with Danes

W. H. Allen, Sons & Co., Ltd., announce that they have concluded a licensee agreement with the Elsinore Shipbuilding & Engineering Co., Ltd., Denmark, for the construction of three 720 kW c.m.r. turbo-alternators for the new passenger vessel now being

built for the Empresa Insulana de Navegacao at Elsinore. The turbines, gears and condensing plant will be built at the Elsinore Yard to the designs and drawings of W. H. Allen, who will also supply certain parts for the turbines and gears. The alternators will be of Danish manufacture.

Diesel Engine Equipment

Visitors to a four-day exhibition held recently by R. A. Lister & Co., Ltd., at Dursley, Glos., saw something of the manufacture and use of the company's latest 19 to 36 h.p. range of air-cooled diesel engines, over 50 items of contractors' plant powered by these units and loaned by manufacturers throughout the country being displayed. During a tour through the factory they were shown the fully mechanised foundry where up to 90 tons of metal is poured daily, magnetic cranes loading pig-iron and scrap into electrically operated lifts feeding the cupolas. Three Ryder six-spindle vertical automatic machines with electrically operated chucks and several multi-spindle drills and borers made by the company were among those operating in the main machine shop. All ferrous swarf from here is collected, cleaned and formed into brickettes which are fed into the foundry furnaces. The engine erection, painting and dispatch shops were visited, with a main test shop where each engine is run on a test stand at varying loads and speeds for a minimum of six hours before it is passed for dispatch. Some 2,000 h.p. is developed by the 50 or more engines normally running simultaneously in this shop.

Among the items of plant on display, which included cranes, a drilling rig, pumps, mixers and crushers, were representative examples of mobile generating and welding plant. A d.c. welding set having a 300 A continuous and 400 A intermittent rating powered by a 28½ h.p. engine was shown by E. P. Allam & Co., Ltd., while a similar engine was used in a 300/400 A single-operator welding set exhibited by Murex Welding Processes, Ltd. This unit incorporates a brush shift generator with an output infinitely variable from 20 to 400 A and an open circuit voltage variable between 70 and 90 V, the maximum continuous hand welding current being 300 A at 30 V.

Lister's showed an 11 kW mobile generator from their range of static and portable air-cooled diesel generating sets, and Welding Industries, Ltd., exhibited two mobile welding plants. The type DA.123 unit, driven by a 17 h.p. engine, has a maximum continuous current of 240 A and a maximum intermittent current of 300 A and can operate with electrodes for welding from 16 to 4 s.w.g. mild steel. The type DA.134 plant is driven by a 25 h.p. 1,500 r.p.m. engine, has corresponding maximum current values of 300 and 400 A and can be used for welding from 16 s.w.g. to $\frac{5}{16}$in mild steel.

Truck Marketing Agreement

An arrangement for common marketing of Hyster internal combustion engined trucks and Ransomes electric trucks in Great Britain is announced by Hyster, Ltd., Glasgow (subsidiary of the Hyster Company, Portland, Oregon, U.S.A.), and Ransomes Sims & Jefferies, Ltd., Ipswich. The arrangement provides for Ransomes to be the sole manufacturers of electric trucks and Hyster to be sole manufacturers of internal combustion engined trucks, all for marketing exclusively by Hyster, Ltd. Both companies will collaborate in design and engineering to the fullest extent. There is no financial link between the two companies.

Lifts for Rangoon Port

Marryat & Scott, Ltd., have obtained an order for eleven heavy duty goods lifts for the transit sheds in the Rangoon Port development scheme. They will be electrically operated, capable of handling up to 700 tons of freight per hour, and will be fitted with automatic levelling equipment to stop accurately at floor levels. The order for the lifts was placed by the main contractor in West Germany and the consulting engineers are Sir Alexander Gibb & Partners.

Representative selection of plant and machinery driven by Lister air-cooled diesel engines. In the foreground is a portable welding equipment made by Welding Industries, Ltd.

Trade Announcements

A London office has been established by the **Key Engineering Co., Ltd.,** to handle day-to-day business in connection with two of its products—pitch fibre underfloor duct and skirting and dado ducts. Inquiries should be sent to the Key Engineering Co., Ltd., Underfloor Duct Division, Blackfriars House, 19, New Bridge Street, London, E.C.4.

The **Wandsworth Electrical Mfg. Co., Ltd.,** announces changes in its sales staff. Mr. J. Page has retired after twenty years' service with the company and Mr. G. V. F. Stephens will now cover the Central London area. Mr. L. P. Holland has been appointed to cover East Anglia, Essex and the Home Counties areas and Mr. D. F. Cooper will represent the company in Middlesex, Kent, Surrey, Sussex and the West London districts.

Siemens Edison Swan, Ltd., has acquired new premises for its Leicester branch office at 247, Western Road, Leicester, which serves Leicestershire, Northants and Rutland. The branch is under the control of Mr. W. H. Jackson, district office manager, Nottingham, and the local manager is Mr. J. S. Jenkinson. The telephone number of the Leicester branch office is still Leicester 58124/5.

The telephone number of **Clang, Ltd.,** has been changed to Gladstone 3322.

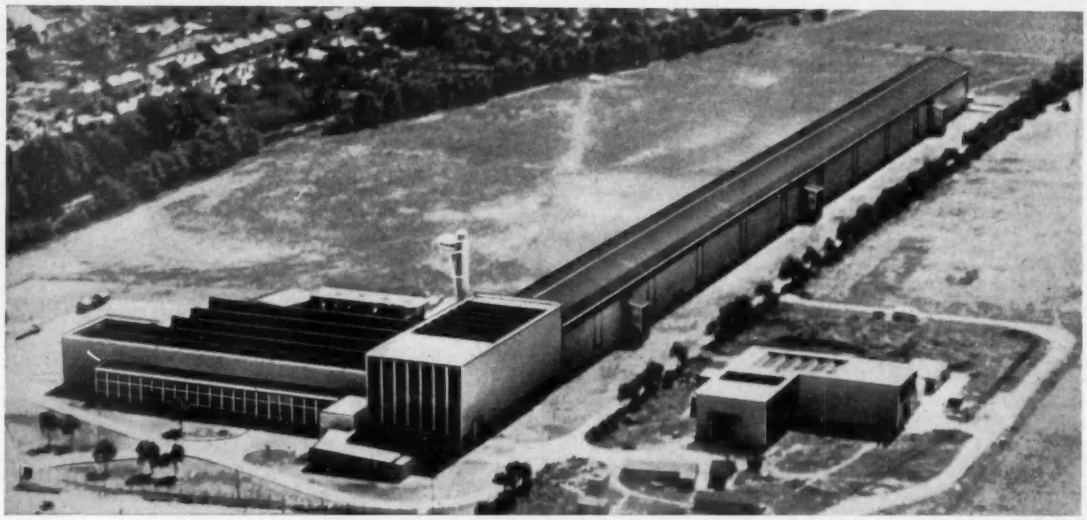
Mr. R. C. Vickery, formerly with the Welmec Corporation, Ltd., has formed a new company to promote the sales of domestic appliances made by a Continental manufacturer. He will be managing director of the new company, with showrooms and offices at Mitre House, 177, Regent Street, W.1 (telephone: Gerrard 5956).

Efco, Ltd., announces the formation of a new division to extend its interests in the foundry trade. New products will include gravity die-casting machines, portable electric mould dryers, shell moulding and shell closing machines. Mr. B. Malone has been appointed manager of the new division.

British Insulated Callender's Cables, Ltd., announces that the telephone number of its Worcester branch office is now Worcester 26966/7.

C.E.G.B. Appointments Vacant

We regret that in the advertisement of the Central Electricity Generating Board for appointments in its Transmission Department at headquarters, published in our last issue, the salaries were incorrectly given. These should be: Posts A to D, £1,475-£2,045 per annum; posts E to G, £1,140-£1,605 per annum.



Marine Design

N.P.L. Ship Hydro-dynamics Laboratory

LAST Monday H.R.H. the Duke of Edinburgh opened the New Ship Hydro-dynamics Laboratory of the Department of Scientific and Industrial Research at Feltham, Middlesex. This laboratory will form part of the Ship Division of the National Physical Laboratory and, basically, it comprises a towing tank 1,300ft long, 45ft wide and 25ft deep, a water tunnel and a sea-keeping tank, 100ft square. The laboratory also includes workshops for making model hulls and propellers, a vibration laboratory and instrument laboratories.

Since the war, the demand for testing designs for new ships has reached such a high level that research programmes have fallen behind. The new laboratory, which has been built at a cost of £2 million, will be used for both research and development work. The main aim of the research will be to build up basic knowledge for the design of merchant ships that can maintain high speeds in rough seas with a high degree of stability. This work will be carried out for Commonwealth countries as well as the United Kingdom.

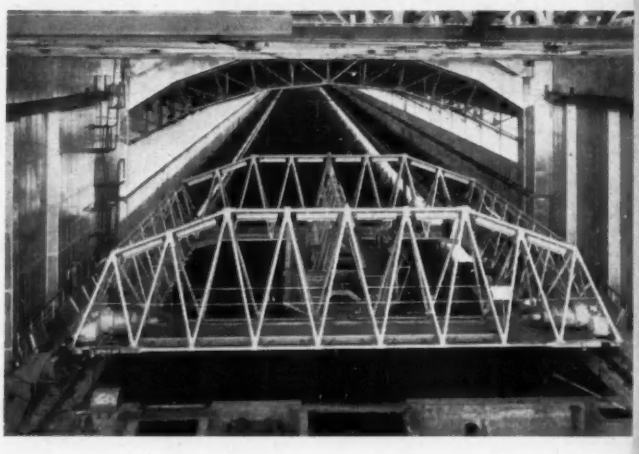
Towing Tank

The towing tank is the major part of the new laboratory and will be used to test large models up to 40ft in length under simulated sea conditions. The towing tank, which is nearly ¼ mile long and 48ft wide, has a depth of 25ft to enable tests to be carried out on submerged models of submarine cargo ships and tankers when these become necessary. The tank was built up of twenty-two 57ft reinforced concrete sections cast *in situ* with a 3ft gap between sections. These gaps were filled with concrete in mid-winter when the temperature was 45°F or less. Since the water in the tank will be maintained at a minimum of 60°F, maximum water-tightness is ensured. The oil-fired heating system consists of background heating using low-pressure hot water heating coils together with a plenum system. Lighting for the main tank consists of cold-cathode fluorescent tubes mounted as a virtually continuous strip along the full length of each wall. Because of the high humidity, the tank is housed in an aluminium-clad structure.

The towing carriage is built on four girders forming a square framework 50ft by 50ft. The open centre space of 36ft square accommodates a fore and aft girder containing dynamometers and other instruments by which the models are towed. The carriage is driven by four bogies each driven by a 300 h.p. d.c. motor to give maximum acceleration to the maximum speed of 50 ft/sec. Normally, braking is by regeneration, but at high speeds mechanical friction brakes will also be used. An aircraft-type hydraulic arrestor gear has also been fitted to act if the other braking systems fail.

A wavemaker, capable of producing waves from 5ft long and 6in high to 40ft long and 2ft high, has been installed at one end of the towing tank. It consists of

Towing tank and carriage



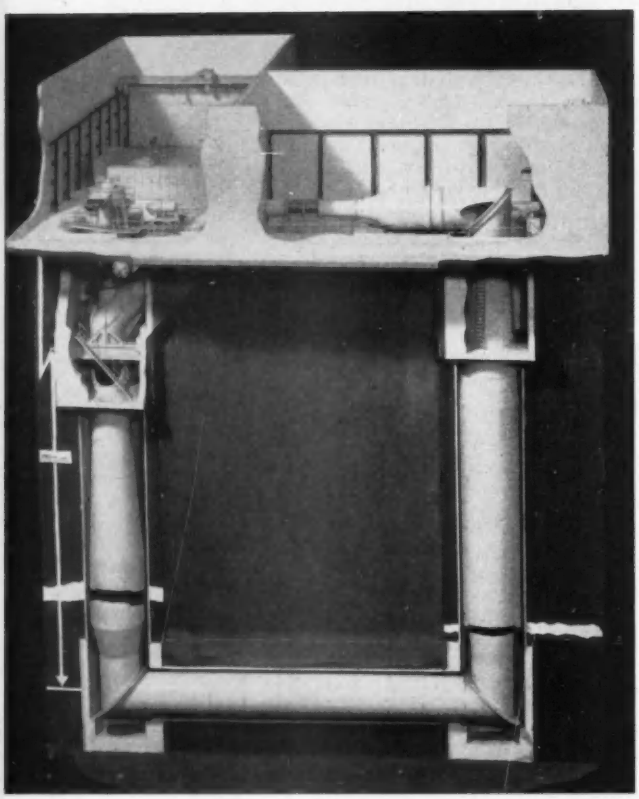
a 20 ton wedge-shaped steel plunger which is vibrated in the vertical plane by hydraulic rams. The control circuit consists basically of "Keelavite" electro-hydraulic servo valves operated by an electronic control system supplied under sub-contract by the A.E.I. Electronic Apparatus Division. A number of feedback loops are incorporated in the circuit and include arrangements to ensure that the movement at each end of the wedge is equal.

The 44in diameter water tunnel has been designed to test large propeller models up to 24in diameter. Thus, it is hoped to solve some of the problems associated with scale effects. The tunnel, which is one of the largest of its type, is designed for a maximum water velocity in the working section of 50 ft/sec. To maintain a constant air content in the water (a typical feature of sea water), the air, which comes out of solution in the working section, is re-absorbed in a high-pressure low-speed section of the tunnel. This requires a rather large circuit which is arranged in the form of a rectangle, one of 87ft short sides being in the tunnel building, the other, 180ft, vertically below. A model of this arrangement is shown below.

Water is circulated through the closed tunnel circuit by a variable-pitch pump with a 92in diameter axial flow impeller. It is driven at a maximum speed of 220 r.p.m. by an 850 h.p. d.c. motor supplied from a Ward-Leonard set. The model propellers under test are driven by a dynamometer motor providing 300 h.p. over a wide speed range.

Tests in the towing tank can be made only at right-angles to the wave motion. To ensure stability at sea, it is necessary to make model experiments in waves at all angles to the model's course. At present the 100ft × 100ft sea-keeping tank is equipped with a single plunger-type wavemaker on one side. Later, it is intended to fit an articulated wavemaker on another side. This will enable confused seas to be generated when desired.

Model of the water tunnel showing the circulating pump and dynamometer motor at the top left



The 8 to 10ft long models in the sea-keeping tank are battery operated and motor speed and steering are controlled by radio. Stability measurements are made by gyroscopes and accelerometers. An equipment is being developed for plotting the position of the model. This will employ the measurement of the time interval at three receiving stations between the emission of an ultrasonic signal from the model (triggered by radio) and its reception.

A site substation handles a demand of 3 MW at 6·6 kV. Provision is made for future increased demand.

The project was designed and constructed by the Ministry of Works for the D.S.I.R. The main contractors were Sir Robert McAlpine & Sons, Ltd., and Thos. W. Ward, Ltd. The main electrical plant and equipment was supplied by the English Electric Co., Ltd.

All-Electric Show Bungalow

AS the result of information gained from visits to the United States and Canada for the purpose of studying the home building industry in those countries, a firm of builders in the Midlands (George Calverley & Sons (Contractors), Ltd., Leicester) has now in hand a development programme of 2,000 houses, all of which can be provided with full central heating. Prospective house purchasers have the choice of any type of heating scheme and three examples have been installed in show houses on a site at Oadby, near Leicester.

In one house a Perkins oil-fired boiler, which uses small bore pipes and an electric pump to provide heating by means of panel radiators or skirting heating units, is installed, while another employs a method whereby "Parasheet" oil fired ducted warm air is circulated throughout the house. For the third example the Leicester Sub-Area of the East Midlands Electricity Board has taken the opportunity to demonstrate the advantages of electric off-peak heating in private houses, and has provided, in conjunction with the builders, an all-electric bungalow equipped with under-floor heating. The "Thermodare" rewirable under-floor heating system is used in this particular bungalow. There are five circuits in all, each of which is controlled by individual thermostats. The living/dining room area has two circuits with respective loadings of 2·48 and 2·98 kW, designed to operate at a temperature of 65°F. A third, 1·1 kW, circuit is fitted in the kitchen (60°F); while the remaining two circuits serve two bedrooms and an adjoining passage (2·5 kW) and a third bedroom and bathroom (1·81 kW). For these the designed temperature is 55°F.

Water heating in the bungalow is by means of an A.E.I.-Hotpoint "Twimmerser" immersion heater fitted into a standard 30 gal hot water storage cylinder. The electricity supply to the floor warming installation, and for the water heating if desired, is given at the "off-peak" rate of ¼d/kWh and it is estimated that the running costs for the floor warming installation only will amount to approximately £41 per year. It is emphasised that the heating system requires no attention whatsoever and the initial cost of installation is much less than alternative central heating systems. Temperatures can, of course, be reduced by altering the setting of the individual thermostats and should additional heating be required a useful number of 13 A socket outlets are provided throughout the bungalow. The kitchen is equipped with a built-in refrigerator, electric cooker and many other electrical appliances, while the meter board, switch fuses, etc., are conveniently mounted on the wall of the adjoining garage.

Northern Outfall Works Generation

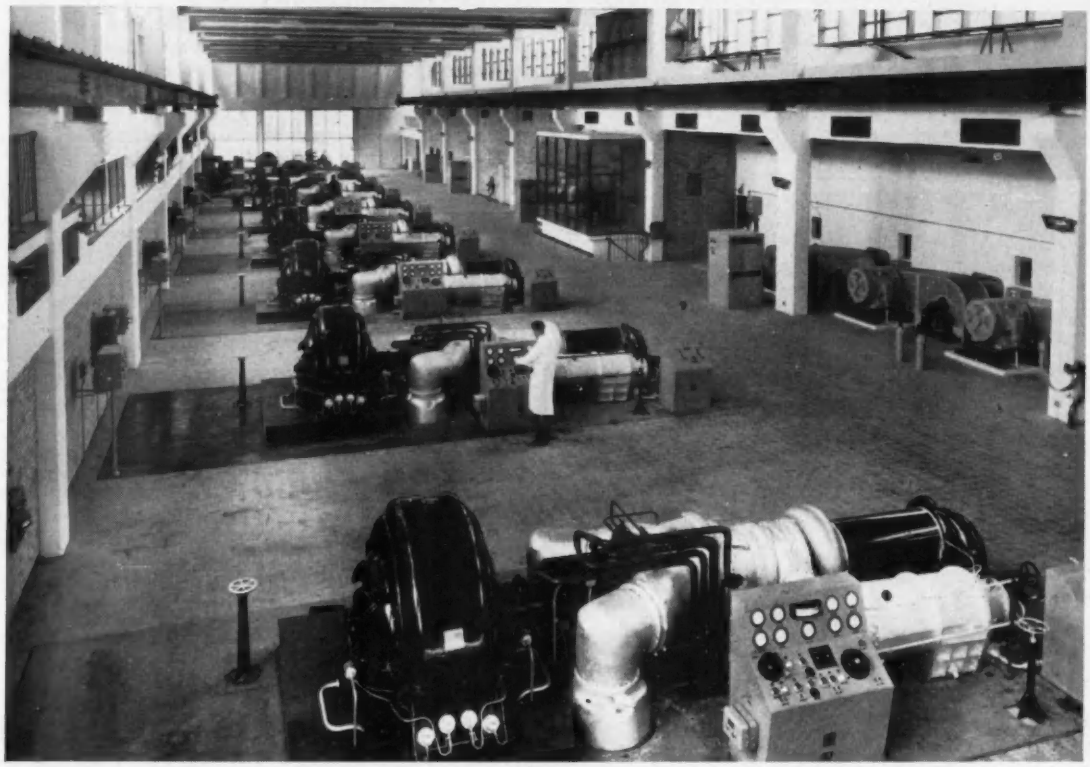
SLUDGE GAS FUEL FOR TURBINES

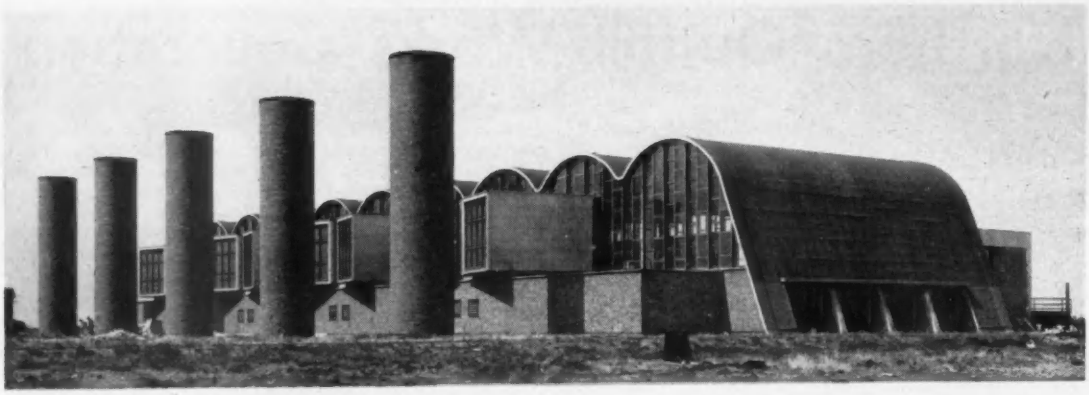
EXTENSIONS costing more than £9½ million and comprising an activated sludge plant, a sludge digestion plant and a power house incorporating alternators and air blowers driven by gas turbines using gas from the digestion plant as a fuel were officially opened yesterday by the Duke of Edinburgh at the London County Council's Northern Outfall Works at Beckton. The 98-acre works handles the sewage, storm water and industrial wastes from a 112 square mile area of northern London having a population of nearly three millions, and the normal dry weather flow is 178 million gallons daily. The total connected load when all the plant is finally commissioned will be approximately 4,150 kW. It is anticipated that the maximum demand will be of the order of 3,000 kW, the power house generating 1,860 kW and 1,140 kW being supplied by the London Electricity Board. The power house alternators can run either in parallel with the L.E.B. supply or independently. The total annual consumption is expected to be approximately 15 million kWh.

Sludge which has settled on the floors of the 16 sedimentation tanks is swept into troughs by electrically driven scrapers and pumped to the digestion plant by four 600 tons/hr pumps. Two 1,000 tons/hr drainage pumps are also provided in the pump house. After passing through de-watering tanks, the sludge enters the 16 primary digestion tanks through "Rosenblad" type heat exchangers where heat is recovered from the outgoing sludge. The heat transfer rate is some 7½ million B.Th.U./hr when the outgoing sludge is reduced in temperature by 15°F. The 80ft diameter digestion tanks have a total capacity of 76,000 tons, and the contents are maintained at a temperature of 85°F to increase the digestion rate by external heaters supplied with water heated at a rate between 20 and 30 million B.Th.U./hr, according to season, by the turbine exhausts. Each tank has a spiral-guided 28,000 cu ft capacity floating gasholder giving a storage of 6½ hr gas production, which normally totals 2½ million cu ft daily. Sludge gas has a normal composition by volume of 70 per cent methane and 30 per cent carbon dioxide and a net calorific value of approximately 625 B.Th.U./cu ft.

The 280ft long by 105ft wide power house is constructed in reinforced concrete with a multi-arch shell roof of precast sections, post-tensioned *in situ*. Eight 960 b.h.p. Ruston & Hornsby gas turbines of the open-cycle, two-shaft type are located in the turbine hall at ground level, five directly coupled to single-stage, double-entry centrifugal type Reavell blowers providing air for sludge

Eight gas turbines drive five blowers, in the foreground, and three alternators





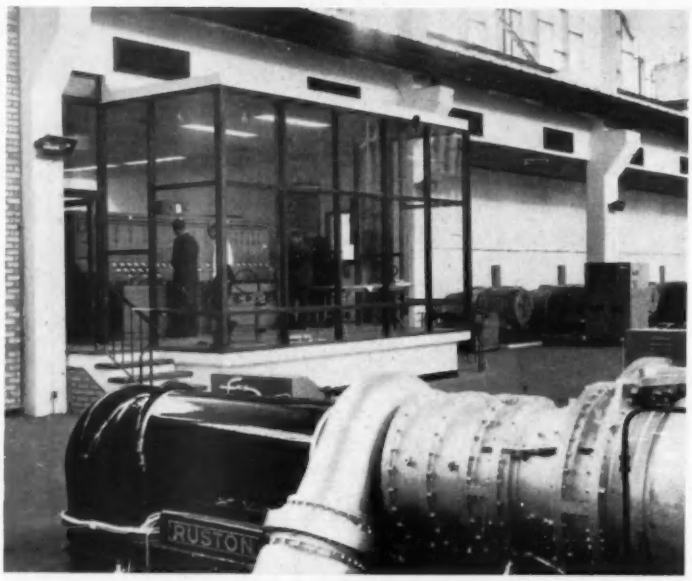
The chimneys and air filtration chambers are on the south side of the power house turbine hall

aeration and three driving 750 kW English Electric alternators through 4:1 reduction gearing. A basement running the full length of the building houses the heat exchangers and water heaters associated with the turbines, the oil- or gas-fired supplementary water heaters and some of the power house services. Air filtration plant, including eight angled filter chambers, is on the south face of the turbine hall, with five separate brick chimneys carrying the turbine exhausts to atmosphere. On the northern side are control, switchgear and gas compression rooms. The main turbine hall lighting consists of four 10ft reflectors, each housing four warm white cold cathode tubes on each of the nine beams supporting the barrel vault roof, giving a total light output of some 342,000 lumens, while each roof vault is illuminated by five single tubes in anodised aluminium reflectors, producing a further 200,000 lumens.

Sludge gas is delivered from the digestion tanks to the power house by an 18in main at a pressure of 4in water gauge, which is increased to 120 p.s.i. in two-cylinder, two-stage, double-acting, inter-cooled Reavell compressors, each with a capacity of 750 cu ft/min, and passed to two 1,050 cu ft receivers. The five compressors, three of which can meet the normal demand for gas, leaving one available for standby duty and one for overhaul, are housed in a separate compartment off the turbine hall and are driven by 180 h.p. English Electric 3·3 kV direct switched induction motors in the turbine hall by a V-belt reduction drive and sealed shaft through the wall. Each compressor is started under automatic control by a pressure switch and associated pilot unloader valve, enabling the compressor to run up to full speed before working on load, thereby reducing the starting load on the motor.

Each turbine has its own console and, when running, can be driven from the console or from the control room. Starting, controlled by a single handwheel on the console, is by electric motor supplied from batteries. Incoming air, compressed by a 13-stage axial flow compressor, passes through the heat exchanger and into the combustion chamber. The combustion gases pass through a two-stage compressor turbine and then a two-stage power turbine, back through the heat exchanger, through the water heater and by underground ducting to the appropriate chimney. The two-flow heat exchangers are 20ft long, have a body diameter of 8¼ft and weigh 45 tons. Each has 4,080 one-inch o.d. tubes and a heating surface of approximately 11,840 sq ft inner surface. The brake thermal efficiency of the turbines is 21·2 per cent, and the waste heat recovery system improves the installation's overall efficiency to some 50 per cent. Although sludge gas is normally used as a fuel, diesel or fuel oil can be used as an alternative, taken from adjacent storage tanks. De Laval oil centrifuge equipment has been provided for the heavy fuel and lubricating oil.

Each of the five blowers has a rated output of 25,000 cu ft of free air per minute at a pressure of 7½ p.s.i. at 6,000 r.p.m. Pressures up to 8½ p.s.i. can be reached by running the turbines at higher speeds. Air for the blowers and turbines is cleaned by being passed



The main control panel in the control room and, on the right, some of the gas compressor motors

through Sturtevant 45,000 c.f.m. electrostatic filters in six of the filter chambers. The ioniser voltage for each filter is 13 kV and the plate voltage is 6 kV. Indicating lights in the control room show which filters are operating.

The alternators are rated at 750 kW, but will normally deliver 620 kW at 3·3 kV with a power factor of 0·8 at 1,500 r.p.m. Outputs up to 750 kW can be obtained by running the turbines at higher blade temperatures.

To meet the electrical requirements of the widely-spaced load centres of the station, a 3·3 kV ring main is installed to link seven substations, at one of which the incoming 22 kV supply from the L.E.B. is introduced via a 2,000 kVA transformer. The system is designed for open ring operation, the "open" position being selected at any of the seven substations. In each sub-station the h.v. switchboards have a rupturing capacity of 100 MVA at 3·3 kV. All are provided with over-current and earth leakage protection. The 415 V switchboards, rated at 25 MVA, controlling outgoing feeders from each sub-section are supplied via 3·3 kV/415 V transformers. Where two transformers are installed these are designed for parallel operation if required.

Power from the alternators is fed to the ring via a 13-panel high-voltage switchboard having horizontal draw-out isolation double-busbar type units with a rupturing capacity of 100 MVA. It comprises three alternator panels, two auxiliary station transformer feeders, five compressor motor panels, two ring main isolators and one busbar coupler. Precautions have been taken to prevent the alternators feeding back into the Board's system in the event of a line-to-line or line-to-earth fault on the h.v. side of the 2,000 kVA transformer. Should this condition arise, the Board's supply would be automatically isolated by reverse power tripping.

A two-relay protection system has been provided on each alternator, one relay operating at 136 A and the other at 164 A, to ensure essential power house services in the event of failure of the L.E.B. supply. In the event of a fault the first operates and trips out the ring main feeders, which in turn trip out two of the three gas turbines, as one is sufficient to supply the station load. The two turbines to be tripped out are predetermined by a "bus and load" selection. If the fault persists and the current continues to rise, the remaining alternator will be tripped out by the second relay.

Control Room

The principal instruments and controls grouped in the control room include a main electrical panel, complete with a mimic diagram, made by Kelvin & Hughes, Ltd., for the remote operation of the h.v. and l.v. switchgear, alternators and compressor motors. In addition to meters recording alternator voltage, frequency, power factor, output, etc., two units indicate the load, and its power factor, being supplied by the L.E.B.

All protection relays for the h.v. and l.v. circuit-breakers are mounted in a composite panel with kWh meters—recording the energy supplied to the sludge digestion plant, workshop block and compressor motors—and the combined alternator automatic voltage and power factor regulators. Two instrumentation panels are installed, one for the blower sets having speed control buttons and indicating air delivered, gas consumed and oil fuel consumed, and one for the alternator sets and water system showing hot water flow, flow temperature, air pressures, total air delivery, circulating water flow, pressure and temperature, pressures in gas receivers, low pressure alarm, fuel consumed (gas and oil), kW recorder and kWh meter for each alternator. Alarms and indicators on an additional panel operate under excessive water temperatures in the water heaters associated with the blowers, alternator units and the supplementary water heaters; gas detection in the compressor room or oxygen detection in the gas receivers.

Air supplies to the sludge aeration channels are of primary importance to keep the 158,000 nozzles clear, and in the event of a complete electrical failure one of two selected blower sets will automatically change from gas to liquid fuel. Duplicate lubricating oil and fuel pumps for these blower sets with d.c. motors, which will start immediately a mains failure occurs, have been installed. The supply for the d.c. motors is derived from auxiliary batteries housed with the main turbine starting batteries. Both sets of batteries are charged simultaneously, but to avoid the auxiliary battery voltage dropping when the main battery is supplying a heavy load on starting conditions, a blocking rectifier has been introduced between the two sets.

The greater part of the power house is fitted with a "Mulsifyre" water spray fire fighting equipment supplied by Mather & Platt, Ltd., associated with a diesel engine driven pump delivering up to 1,250 gal/min at a pressure of 100 p.s.i. The gas compressor room has a Pyrene carbon dioxide system comprising 19 cylinders of 80 lb capacity each. A fire annunciator panel is provided in the control room covering both systems, and either can be operated manually at the scene of the fire or remotely from the control room.

The main contractors for the power house were:—Civil engineering, Richard Costain, Ltd.; building work, Demolition & Construction Co., Ltd.; main plant, Ruston & Hornsby, Ltd.; and electrical gear, English Electric Co., Ltd.

Favourable Export Prospects

THE most potentially favourable situation for British exports since the G.E.C. *Export Guide* was first published three years ago is recorded in the October issue. In only four of Britain's 34 major markets are the prospects to the end of the year shown as deteriorating or bad. These are in Iraq, Venezuela, India and South Africa. Since the last issue, in July, the outlook for British exports has improved in Finland, Italy, Kenya, Malaya and Singapore, Netherlands, Norway, Spain and the Soviet Union. In no major market have the prospects changed for the worse.

Whether the new alignment of the "Outer Seven" countries will contribute to a wider agreement with the Common Market on the lines of the original Free Trade Area proposals or create further difficulties is thought to be open to question. A special article on the prospects offered by this new association points out that no concession is made in the Outer Seven agreement to the more dynamic approach to economic integration embodied in the Rome Treaty and moreover it links the United Kingdom with the "neutralist approach." If the Outer Seven and Common Market "continue their divergent ways for long, they will tend to loosen those very ties that at present encourage a wider grouping, and the hoped for economic unity of Western Europe will be remote." British gains in the Outer Seven market (chiefly at the expense of West Germany) will be "partly offset by Britain's declining share of the Common Market's increased trade."

The "great opportunities" provided by some of the world's smaller markets are the subject of a second article. It is noted that British exports to 20 such markets expanded by 500 per cent during the 10 years to 1958, compared with an increase of 100 per cent in Britain's total exports. The chief demand is for machinery and capital goods; consumer goods tend to find their markets in richer, more sophisticated countries. The factors that count most for success are "quality, modern design and adaptation to local tastes and requirements."

DOMESTIC ELECTRICAL EQUIPMENT

KETTLES AND PERCOLATORS

THERE are just over twenty manufacturers of electric kettles in this country but, apart from the individual differences in styling, most makers' models conform to a more-or-less standard pattern, the majority being made of aluminium or chromium-plated copper. They can be obtained in various sizes ranging from 2 to 10 pints in water capacity, but the models most in demand are undoubtedly the 3 or 4 pint sizes.

Although it is believed that many kettles with clamp-on elements fitted to the base are still in everyday use, they are now obsolete and all present-day electric kettles have immersion type elements. The standard loading varies between 1,000 W and 1,500 W. More manufacturers are, however, now offering models with the speedier 2 kW element, and even higher. Bulpitt & Sons, Ltd., manufacturers of "Swan Brand" electric kettles, for example, recently announced higher loadings for their "Swift," "Siren" (2,500 W each) and "Royal" kettles (2,300 W), while the "Hi-Speed," the latest A.E.I.-Hotpoint kettle, has a loading of 2,300 W.

The range of coffee percolators available remains much the same as when these were reviewed eighteen months ago. One exception is the Cona "New" table model which replaces the company's traditional "De Luxe" coffee maker, now discontinued after being on the market for many years. The "New" model incorporates additional features such as a funnel holder, which now becomes part of the stand, and a heater with a tubular element, while its compact design allows the complete appliance to be held in one hand. Replacement parts will continue to be available for the original model for as long as required.

KETTLES

Manufacturer	Name or Model	Capacity	Element Loading	Body	Handle	Special Features	Price (excl. tax)	Purchase Tax
A.E.I.-HOTPOINT, LTD., 33, Grosvenor Place, London, S.W.1.	Premier "Pylon" 2939S, 2939 and 2939A	3 pint	2,000 W (2939S), 1,500 W (2939) and 1,000 W (2939A)	Chromium plated copper	Moulded plastic	Safety cut-out, "Torribar" elements	£3 19 11	£0 14 7
	Premier "Pylon" 2947S and 2947	4½ pint	2,000 W (2947S) and 1,500 W (2947)	Chromium plated copper	Moulded plastic	Safety cut-out, "Torribar" elements	£4 10 10	£0 16 8
	Premier "Pylon" 2833S, 2833 and 2833A	3 pint	2,000 W (2833S), 1,500 W (2833) and 1,000 W (2833A)	Polished aluminium	Moulded plastic	Safety cut-out, "Torribar" elements	£2 19 2	£0 10 10
	Hotpoint "Hi-Speed" 3QA	3 pint	2,300 W, 1,500 W and 1,000 W	Chromium plated copper	Moulded plastic, black or red	Safety cut-out, "Torribar" elements	£4 3 3 (2,300 W) £4 1 7 (1 or 1½ kW)	£0 15 3 (2,300 W) £0 14 11 (1 or 1½ kW)
H. J. BALDWIN & CO., LTD., 132, Arkwright Street, Nottingham.	"Tudor"	3½ pint	1,500 W and 2,000 W	Polished aluminium	Aluminium strip, moulded grip	Automatic safety device	£2 17 6	£0 10 0
	"Balmoral"	3½ pint	1,500 W and 2,000 W	Polished aluminium	Black Bakelite	Automatic safety device	£3 2 6	£0 10 9
	"Windsor"	3½ pint	1,500 W and 2,000 W	Chromium plated copper	Black Bakelite	Automatic safety device	£4 8 6	£0 15 3
BESCOL (ELECTRIC), LTD., 118, Parkfield Road, Saltley, Birmingham, 8.	"Elephant" 208	3 pint	1,500 W and 2,000 W	Chromium plated copper	Black or red Bakelite	Thermostatic safety device	£3 19 6 (1½ kW) £4 0 6 (2 kW)	£0 14 4 (1½ kW) £0 14 6 (2 kW)
	"Elephant" 214	3½ pint	1,500 W and 2,000 W	Polished aluminium	Black or red Bakelite	Thermostatic safety device	£2 18 6 (1½ kW) £2 19 6 (2 kW)	£0 10 7 (1½ kW) £0 10 9 (2 kW)
BEST PRODUCTS, LTD., Felix Works, Felixstowe, Suffolk.	"Fanfare"	3½ pint	1,500 W with cut-out	Chromium plated copper (a) and polished lacquered copper (b)	Black or red Bakelite	Organ toned musical alarm	£4 15 0 (a) £4 7 6 (b)	£0 17 4 (a) £0 16 0 (b)
	"Jiffy"	2 pint	1,250 W	Chromium plated copper	Black Bakelite	Fast boiling, handle fixing prevents steam damage	£3 5 3	£0 11 11

Manufacturer	Name or Model	Capacity	Element Loading	Body	Handle	Special Features	Price (excl. tax)	Purchase Tax
BEST PRODUCTS, LTD., Felix Works, Felixstowe, Suffolk. *(continued)*	"Herald"	4 pint	1,500 W	Anodised aluminium (range of 5 colours)	Black Bakelite	Organ toned musical alarm	£2 17 0	£0 10 5
	"Standard"	3 pint	1,500 W	Polished aluminium	Metal strip, moulded grip	Block spout	£2 10 0	£0 9 1
	"Suffolk"	3½ pint (a) 3 pint (b)	1,500 W (a) 2,000 W (b)	Chromium plated copper	Black or red Bakelite	Fast boiling, block spout	£3 17 11 (a) £4 0 10 (b)	£0 14 3 (a) £0 14 9 (b)
	"Essex"	3½ pint (a) 3 pint (b)	1,500 W (a) 2,000 W (b)	Polished aluminium	Black or red Bakelite	Fast boiling, block spout	£2 17 5 (a) £3 0 4 (b)	£0 10 6 (a) £0 11 0 (b)
BULPITT & SONS, LTD., St. George's Works, 132, Icknield Street, Birmingham.	"Royal" CH.102	2 pint	1,000 W	Chromium plated copper	Heat insulated moulded plastic	Safety positioned knob and steam vent	£3 8 1	£0 12 5
	"Royal" CH.103	3 pint	1,000 W	Chromium plated copper	Heat insulated moulded plastic	Safety positioned knob and steam vent	£3 17 4	£0 14 2
	"Royal" CH.103A	3 pint	1,500 W	Chromium plated copper	Heat insulated moulded plastic	Safety positioned knob and steam vent	£3 19 6	£0 14 6
	"Royal" CH.103B and CH.103C	3 pint	2,000 W and 2,300 W	Chromium plated copper	Heat insulated moulded plastic	Safety positioned knob and steam vent	£4 2 0	£0 15 0
	"Royal" CH.105	5 pint	2,000 W	Chromium plated copper	Heat insulated moulded plastic	Safety positioned knob and steam vent	£4 12 7	£0 16 11
	"Siren" CH.440 and CH.440D	3 pint	2,000 W and 2,500 W	Chromium plated copper	Heat insulated moulded plastic	Trigger action lid with built-in whistle	£4 10 11	£0 16 7
	"Swift" CH.303 and CH.303D	3 pint	2,000 W and 2,500 W	Chromium plated copper	Heat insulated moulded plastic	Fast boiling	£4 2 5	£0 15 1
	"Popular" C.223	3 pint	1,000 W	Polished copper	Heat insulated moulded plastic	Safety positioned knob and steam vent	£3 6 4	£0 12 2

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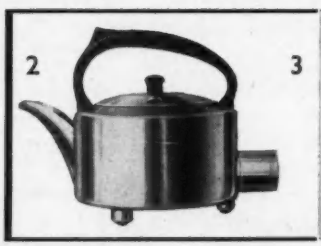

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1. *Best Products "Essex" kettle*
2. *Bescol "Elephant" 208 kettle*
3. *Bulpitt "Royal" kettle*
4. *H. J. Baldwin "Thermat" "Windsor" kettle*
5. *A.E.I.-Hotpoint "Hi-Speed" kettle*
6. *Bulpitt "Siren" whistling kettle*

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Manufacturer	Name or Model	Capacity	Element Loading	Body	Handle	Special Features	Price (excl. tax)	Purchase Tax
	"Popular" C.223A	3 pint	1,500 W	Polished copper	Heat insulated moulded plastic	Safety positioned knob and steam vent	£3 8 6	£0 12 6
	"Popular" C.226	6 pint	2,000 W	Polished copper	Heat insulated moulded plastic	Safety positioned knob and steam vent	£4 3 3	£0 15 3
	"Popular" CH.223	3 pint	1,000 W	Chromium plated copper	Heat insulated moulded plastic	Safety positioned knob and steam vent	£3 14 0	£0 13 6
	"Popular" CH.223A	3 pint	1,500 W	Chromium plated copper	Heat insulated moulded plastic	Safety positioned knob and steam vent	£3 16 1	£0 13 11
	"Popular" CH.224A	4 pint	1,500 W	Chromium plated copper	Heat insulated moulded plastic	Safety positioned knob and steam vent	£4 3 3	£0 15 3
	"Popular" CH.224B	4 pint	2,000 W	Chromium plated copper	Heat insulated moulded plastic	Safety positioned knob and steam vent	£4 5 10	£0 15 8
	"Popular" CH.226	6 pint	2,000 W	Chromium plated copper	Heat insulated moulded plastic	Safety positioned knob and steam vent	£4 12 7	£0 16 11
	"Popular" A.223	3 pint	1,000 W	Aluminium	Heat insulated moulded plastic	Safety positioned knob and steam vent	£2 15 4	£0 10 2
BULPITT & SONS, LTD., St. George's Works, 132, Icknield Street, Birmingham. *(continued)*	"Popular" A.223A	3 pint	1,500 W	Aluminium	Heat insulated moulded plastic	Safety positioned knob and steam vent	£2 17 6	£0 10 6
	"Popular" A.224A	4 pint	1,500 W	Aluminium	Heat insulated moulded plastic	Safety positioned knob and steam vent	£3 3 0	£0 11 6
	"Popular" A.224B	4 pint	2,000 W	Aluminium	Heat insulated moulded plastic	Safety positioned knob and steam vent	£3 5 6	£0 12 0
	"Popular" A.226	6 pint	2,000 W	Aluminium	Heat insulated moulded plastic	Safety positioned knob and steam vent	£3 8 11	£0 12 7
	"Kitchen" 200	3½ pint	1,000 W	Brown vitreous enamel	Vitreous enamel	—	£2 11 7	£0 9 5
	"Kitchen" 205	3½ pint	1,500 W	Brown vitreous enamel	Vitreous enamel	—	£2 13 8	£0 9 10
	"Kitchen" C.200	3½ pint	1,000 W	Cream and green vitreous enamel	Vitreous enamel	—	£2 17 1	£0 10 5
	"Kitchen" C.205	3½ pint	1,500 W	Cream and green vitreous enamel	Vitreous enamel	—	£2 19 2	£0 10 10
	Combined kettle and saucepan	Kettle: 3 pint. Inner pan: 1½ pint	2-heat 1,250/125 W	Chromium plated copper. Aluminium pan	Heat insulated moulded plastic	—	£4 17 2	£0 17 10

Manufacturer	Name or Model	Capacity	Element Loading	Body	Handle	Special Features	Price (excl. tax)	Purchase Tax
BUNCHER & HASELER, LTD., Branston Street, Birmingham, 18.	877	6 pint	2,000 W	Polished aluminium	Black plastic	—	£3 12 0	£0 13 6
	942	4 pint	1,500 W	Blue anodised aluminium	Red plastic	—	£3 9 9	£0 12 9
CHALFONT ELECTRICAL PRODUCTS, LTD., Tyrrell Street, Leicester.	"Streamline"	4 pint	1,500 W	Polished aluminium	Moulded plastic	All welded construction	£2 17 6	£0 10 6
CO-OPERATIVE WHOLESALE SOCIETY, LTD., National Works, Hall Street, Dudley, Worcs.	"C.W.S. Dudley"	4 pint	1,250 W	Polished aluminium	Black Bakelite	—	£2 12 0	£0 9 6
	"C.W.S. Dudley"	4 pint	1,500 W	Polished aluminium	Black Bakelite	—	£2 14 0	£0 9 11
	"C.W.S. Dudley"	4 pint	1,250 W	Vitreous enamel	Vitreous enamel	—	£2 13 4	£0 10 0
A. D. DAVIDSON ELECTRIC CO., Granville Street, Birmingham, 1.	"Paramount"	3 pint	1,500 W (a) 2,000 W (b)	Chromium plated copper	Black Bakelite	Spout filling, no lid	£3 10 0 (a) £3 12 0 (b)	£0 12 10 (a) £0 13 2 (b)
DEPENDABLE PRODUCTS, LTD., Queensway, Team Valley Trading Estate, Gateshead, 11.	"Standard"	3½ pint	1,500 W	Aluminium (a) Chromium (b)	Moulded plastic	—	£2 18 10 (a) £3 8 6 (b)	£0 10 8 (a) £0 12 6 (b)
	"Queensway"	3½ pint	1,500 W	Aluminium (a) Chromium (b)	Moulded plastic	—	£3 5 1 (a) £3 15 4 (b)	£0 11 11 (a) £0 13 8 (b)
	"Royal"	3½ pint	1,500 W	Aluminium (a) Chromium (b)	Moulded plastic	—	£2 19 2 (a) £3 9 10 (b)	£0 10 10 (a) £0 12 8 (b)
ELTRON (LONDON), LTD., Strathmore Road, Croydon, Surrey.	"Combinax"	1½ pint	500, 700 and 1,000 W	Polished aluminium	Red Bakelite	Removable element	£2 11 6 (500 W) £2 14 6 (700 W) £3 2 6 (1,000 W)	£0 9 8 (500 W) £0 10 3 (700 W) £0 11 9 (1,000 W)
	Car Kettle	1½ pint (a) 1¾ pint (b)	—	Polished aluminium	Black Bakelite	For use on 12 V car battery	£1 15 0 (a) £2 12 6 (b)	£0 0 11 (a) £0 2 6 (b)
FORDHAM PRESSINGS, LTD., Dudley Road, Wolverhampton.	"Pollyput"	4 pint	1,500 W	Rigid polychene, two-tone colours	Rigid polythene	Non-metallic, push-button lid control with whistle	£3 2 3	£0 11 3
GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.	D.5183	3 pint	2,000 W	Polished aluminium	Black Bakelite	Super-speed boiling, corrosion resistant, re-set safety device	£3 3 5	£0 11 7
	D.5185	5 pint	2,000 W	Polished aluminium	Black Bakelite	Super-speed boiling, corrosion resistant, re-set safety device	£3 13 7	£0 13 5

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7. Eltron car kettle
8. Fordham "Pollyput" non-metallic kettle
9. Chalfont "Streamline" kettle
10. C.W.S. "Dudley" kettle

Manufacturer	Name or Model	Capacity	Element Loading	Body	Handle	Special Features	Price (excl. tax)	Purchase Tax
GENERAL ELECTRIC CO., LTD., Magnet House, Kingway, W.C.2. *(continued)*	D.5235	5 pint	2,000 W	Chromium plated copper	Black Bakelite	Super-speed boiling, re-set safety device	£5 8 8	£0 19 10
	D.5353A	3 pint	2,000 W	Chromium plated copper	Black Bakelite	Super-speed boiling, re-set safety device	£4 1 7	£0 14 11
L. G. HAWKINS & CO., LTD., 30-35, Drury Lane, London, W.C.2.	L.G.H.707	3½ pint	1,500 W	Polished aluminium	Steel with plastic grip	Automatic	£2 19 6	£0 10 11
	L.G.H.66	3½ pint	1,500 W	Chromium plated copper	Steel with plastic grip	Automatic	£4 9 6	£0 16 4
	L.G.H.203	2 pint	750 W	Polished aluminium	Metal	Non-automatic	£1 12 9	£0 6 0
	L.G.H.303	2 pint	750 W	Polished aluminium	Metal	Automatic	£2 0 11	£0 7 6
	L.G.H.603	3 pint	1,000 W	Polished aluminium	Polished aluminium	Non-automatic	£1 17 6	£0 6 10
	L.G.H.703	3 pint	1,000 W	Polished aluminium	Polished aluminium	Automatic	£2 6 6	£0 8 6
LINCASS ELECTRIC, LTD., Guildford Street, Chertsey, Surrey.	950/951	3½ pint	1,000 and 1,500 W	Chromium plated copper	Metal, plastic grip	—	£3 17 6 (1 kW) £3 19 6 (1½ kW)	£0 14 2 (1 kW) £0 14 6 (1½ kW)
	780/781	3½ pint	1,000 and 1,500 W	Aluminium, coloured enamel finish	Metal, plastic grip	—	£3 2 6 (1 kW) £3 4 6 (1½ kW)	£0 11 6 (1 kW) £0 11 9 (1½ kW)
	770/771	3½ pint	1,000 and 1,500 W	Polished aluminium	Metal, plastic grip	—	£2 15 6 (1 kW) £2 17 6 (1½ kW)	£0 10 1 (1 kW) £0 10 6 (1½ kW)
METWAY ELECTRICAL INDUSTRIES, LTD., Canning Street, Kemp Town, Brighton, 7.	"Midgetway" DA.303	2 pint	750 W	Polished aluminium	Red moulded plastic	Non-automatic	£1 10 3	£0 5 5
	"Miniway New" DA.389	2 pint	750 W	Polished aluminium	Moulded plastic	Non-automatic	£1 18 9	£0 7 0
	"Miniway De-Luxe" DA.429	2 pint	750 W	Polished aluminium	Moulded plastic	Automatic	£2 2 9	£0 7 8
	"Boilaway" DA.559	4 pint	1,500 W	Polished aluminium	Moulded plastic	Automatic	£2 15 9	£0 10 1

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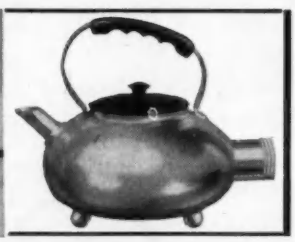

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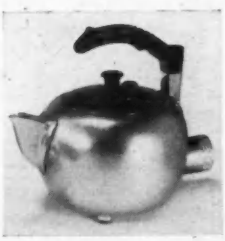

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11. *Metway "Nestaway" car kettle*
12. *Pifco model 1074 kettle*
13. *Mirroware model EL.981 "Mirro-Matic" kettle*
14. *Russell Hobbs vapour controlled kettle*
15. *Lincass model 950/951 kettle*
16. *G.E.C. model D.5353A "Superspeed" kettle*
17. *Revo "Savoy" kettle*

Manufacturer	Name or Model	Capacity	Element Loading	Body	Handle	Special Features	Price (excl. tax)	Purchase Tax
METWAY ELECTRICAL INDUSTRIES, LTD., Canning Street, Kemp Town, Brighton, 7. (*continued*)	"Boilaway" DA.549	4 pint	1,000 W	Polished aluminium	Moulded plastic	Automatic	£2 14 9	£0 9 10
	"Fastaway" DA.589	4 pint	1,800 W	Polished aluminium	Moulded plastic	Automatic	£2 18 9	£0 10 7
	"Fastaway" DA.630	4 pint	2,000 W	Polished aluminium	Moulded plastic	Automatic	£3 3 0	£0 11 4
	"Majaway" DA.699	6 pint	2,000 W	Polished aluminium	Moulded plastic	Automatic	£3 9 9	£0 12 7
	"Nestaway" car kettle	2 pint	200 W	Polished aluminium	Green, collapsible	12 V only	£1 12 8	£0 5 11
THE MIDLAND METAL SPINNING CO., LTD., Tower Works, Pelham Street, Wolverhampton.	"Tower Brand" 34 (a) and 82 (b)	3 pint	1,500 W	Polished aluminium (a) Chromium plated copper (b)	Bakelite	—	£2 15 0 (a) £3 12 6 (b)	£0 10 0 (a) £0 13 2 (b)
MIRROWARE CO., LTD., Edgware Road, London, W.2.	"Mirro-Matic" EL.981 and EL.982	4 pint	1,500 W or 2,000 W	Chromium (EL.981) Polished aluminium (EL.982)	Black Bakelite	Red, blue, green or gold lids, spherical shape	£4 4 1 (EL.981) £3 16 1 (EL.982)	£0 15 5 (EL.981) £0 13 11 (EL.982)
	"Mirro-Matic" EL.582	4 pint	1,500 W	Aluminium	Red Bakelite	—	£2 13 3	£0 9 9
	"Mirro-Matic" EL.975	2 pint	1,000 W	Chromium	Black Bakelite	Streamline handle, spherical shape	£3 6 9	£0 12 4
PIFCO, LTD., Watling Street, Manchester, 4.	1074	4 pint	1,500 W	Golden anodised body, black lid	Plastic handle grip	Non-drip spout, plastic feet, cut-out	£3 9 9	£0 12 9
	1081	4 pint	2,000 W	Polished aluminium	Plastic handle grip	Plastic feet, cut-out	£4 2 5	£0 15 1
REVO ELECTRIC CO., LTD., Tipton, Staffs.	"Savoy"	3 pint	2,000 W	Chromium plated copper	Black Bakelite	Quick heating element	£3 19 6	£0 14 6
	"Cumberland"	3 pint	2,000 W	Polished aluminium	Red Bakelite	Quick heating element	£2 18 0	£0 10 7
RUSSELL HOBBS, LTD., 1, Bensham Lane, West Croydon, Surrey.	"Russell Hobbs" K.2	3½ pint	1,750 W	Chromium plated copper	Moulded plastic	Vapour controlled, switches off when water boils	£4 3 6	£0 15 2
ERNEST STEVENS, LTD., P.O. Box 2, Cradley Heath, Staffs.	"Elegance"	3½ pint	2,000 W	Vitreous enamelled, ivory	Black Bakelite	—	£3 8 5	£0 11 1

COFFEE PERCOLATORS

Manufacturer	Name or Model	Capacity	Element Loading	Body	Handle	Special Features	Price (excl. tax)	Purchase Tax
A.E.I.-HOTPOINT, LTD., 33, Grosvenor Place, London, S.W.1.	Premier 652	8 cups	400 W	Chromium plated copper	Black moulded plastic	Safety cut-out, glass top	£6 17 9	£1 5 3
BEST PRODUCTS, LTD., Felix Works, Felixstowe, Suffolk.	"Best" No. 4	1½ to 2½ pint	500 W	Chromium on copper or pastel enamel shades	Black Bakelite	Automatic cut-out, indicator lights, pre-set percolation	£6 5 0 (chromium) £5 16 11 (enamel)	£1 2 10 (chromium) £1 1 4 (enamel)
	"Warwick"	1¼ to 2 pint	500 W	Ceramic, pastel shades	As body	Black lid and matching base	£3 15 11	£0 13 10
BULPITT & SONS, LTD., St. George's Works, Icknield Street, Birmingham, 18.	"Mayfair" 480 S	1⅞ pint	400 W	Chromium plated copper	Black moulded plastic	Re-set safety device	£5 4 10	£0 19 2
	"Dorchester" 450 S	2 pint	400 W	Polished aluminium	Black moulded plastic	Re-set safety device	£3 12 8	£0 13 4
	"Belgrave" G.470	2 pint	450 W	Fine earthenware, green	Fine earthenware	Fully automatic	£5 14 1	£1 0 11

Manufacturer	Name or Model	Capacity	Element Loading	Body	Handle	Special Features	Price (excl. tax)	Purchase Tax
BULPITT & SONS, LTD., St. George's Works, Icknield Street, Birmingham, 18. *(continued)*	"Winchester" 490	2 pint	400 W	Aluminium, chromium plated	Black moulded plastic	Fully automatic	£5 4 10	£0 19 2
"CONA" COFFEE MACHINE CO., Felden Works, Railway Place, Wimbledon, S.W.19.	"New" Table Model, A, B, C & D	½ to 2 pint	350 W	Chromium plated zinc stand, glass bowls	Metal and plastic	Accessories include funnels and drainers	£6 2 3 to £7 5 3	£1 1 5 to £1 5 1
	"Rex"	1½ pint	350 W	Cast aluminium stand, glass bowls	Incorporated in body	On-off switch. Obtainable in range of enamelled colours	£8 19 9	£1 11 6
A. D. DAVIDSON ELECTRIC CO., 62-66, Granville Street, Birmingham, 1.	"Davey" C.601	1½ pint	400 W	Chromium on copper	Bakelite	Urn type fitted with tap	£4 14 6	£0 17 4
	"Davey" C.603	2½ pint	500 W	Chromium on copper	Bakelite	Urn type fitted with tap	£5 15 6	£1 1 2
	"Davey" C.606	4½ pint	950 W	Chromium on copper	Bakelite	Urn type fitted with tap	£8 7 6	£1 10 8
	"Davey" C.618	1½ pint	400 W	Chromium on copper	Bakelite	Jug type	£5 2 11	£0 18 10
	"Davey" C.608	8 pint	1,500 W	Chromium on copper	Bakelite	Urn type fitted with tap	£17 10 0	£3 4 0

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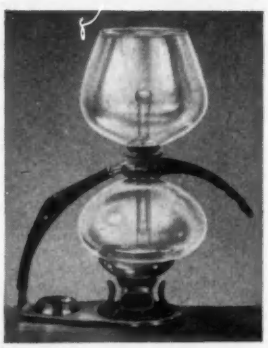
18. *Lincass model 651 percolator*
19. *Russell Hobbs coffee pot*
20. *Best Products "Warwick" percolator*
21. *A.E.I.-Hotpoint "Premier 652" percolator*
22. *Bulpitt "Winchester" percolator*
23. *Falk, Stadelmann "Quik-Perc" percolator*
24. *A. D. Davidson "Davey" model C.608 urn-type percolator*
25. *S.L.R. "Phoenix" model CB.6 coffee maker*
26. *G.E.C. model D.5373 percolator*
27. *Cona "New" table model coffee maker*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Manufacturer	Name or Model	Capacity	Element Loading	Body	Handle	Special Features	Price (excl. tax)	Purchase Tax
FALK, STADELMANN & CO., LTD., 91, Farringdon Road, London, E.C.1.	"Quik-Perc" U.95741	2½ pint	600 W	Chromium plated aluminium	Heat resisting plastic	Graduated interior for ease of filling	£4 14 4	£0 17 3
GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2.	D.5373	1½ pint	400 W	Chromium on copper	Black Bakelite	High and low heat control, thermal protection device	£6 16 6	£1 5 0
LINCASS ELECTRIC, LTD., Guildford Street, Chertsey, Surrey.	651	1½ pint	500 W	Chromium plated, black anodised	Black Bakelite	Earthed connector	£4 4 0	£0 15 4
	681	1½ pint	500 W	Coloured enamel	Black Bakelite	Earthed connector	£4 10 0	£0 16 6
RUSSELL HOBBS, LTD., 1, Bensham Lane, West Croydon, Surrey.	"Russell Hobbs"	1 to 2 pint	600 W	Ceramic, primrose, dove grey and green, three contemporary flower decorations. Also maroon and "Empire" finish	Ceramic	Time control selector. Companion sugar basin and jug extra. Matching coffee set, 6 cups and saucers	£4 4 0 (a.c.) £4 7 6 (a.c./d.c.) £0 11 8 (companion set) £1 12 6 (coffee set)	£0 15 2 (a.c.) £0 15 10 (a.c./d.c.) £0 0 11 (companion set) £0 2 11 (coffee set)
S.L.R. ELECTRIC, LTD., 2, Peterborough Road, Harrow, Middlesex.	"Phoenix" CB.6	1½ pint	500 W	Heat-resisting glass	White Bakelite	Can be used independently on electric hot-plates	£3 0 0	£0 11 3

Instrument Company's Diamond Jubilee

THE business of Nalder Brothers & Thompson, Ltd., was incorporated in 1899, and to mark the sixtieth year of its incorporation a diamond jubilee dinner was held on Saturday last at the Empire Rooms, Tottenham Court Road, London, over 400 sitting down to dinner under the chairmanship of Mr. A. G. O'Neill, chairman of the company.

Although it is sixty years since the company was incorporated, the business is a good deal older as it was in 1884 that Mr. F. H. Nalder and his brother, Mr. H. Nalder, began to make electrical testing instruments and physical apparatus at Brentford. Two years later they were joined by Mr. C. W. Crawley (inventor of the "Crawley" automatic cut-out), and on the removal of the works to Horseferry Road, Westminster, in 1887, they were also joined by Mr. A. Soames (inventor of the "Soames" electric brake), and from the three names, Nalder, Crawley and Soames, came the company's trade mark "N.C.S." In 1896 the business was divided, Mr. Nalder purchasing the goodwill of the ammeter and voltmeter business, which was carried on as Nalder Bros. & Thompson, and the testing, physical and other instrument work was disposed of in 1897 to Muirhead & Co. Works were established at Dalston in 1899 for the manufacture of l.v. switchgear, circuit-breakers and switchboards, as well as instrument parts for the main works. Eventually the Dalston Lane Works took over the whole of the production and these works have been extended from time to time to cope with the expanding business. The following years saw the development of specialised instruments, including power factor meters, wattmeters, synchroscopes, frequency meters, and protective relays of many kinds, incorporating designs patented by Mr. C. L. Lipman, the chief technical engineer. During the war years part of the business went to Stroud, Glos., under the management of Mr. D. W. Nalder, and much of the company's activities was directed to the national war effort. In 1946 further premises were acquired at Poole, Dorset, where smaller specialised apparatus is now manufactured.

At last Saturday's dinner the toast of the company was proposed by Mr. S. F. Steward, director of the British Electrical and Allied Manufacturers' Association, who said that the company was one of a select group of great concerns who had laid the foundations of the electrical industry. Mr. H. F. Nalder was one of the leaders of the electrical industry and was one of those who had helped to found the National Electrical Manufacturers' Association; he was also the first chairman of the B.E.A.M.A. Mr. Steward spoke of the continuing family spirit in the business and mentioned that descendants of the founders were on the board today. Mr. O'Neill, the present chairman, had been with the company for sixty years and Mr. E. W. Semmens was approaching his fiftieth year with the company.

Mr. O'Neill, in responding, said that it was an occasion for pausing to reflect on the past and the future. As to the future, their order book was full. The employees were proud of the family spirit, and he spoke appreciatively of their loyalty and also paid a tribute to the technical staff who had put the company among the leaders of the instrument industry.

Mr. Semmens proposed the toast of the guests, expressing appreciation of the presence of many well-known men from the various branches of the electrical industry who had come from far and wide to join in their celebrations. The response was made by Mr. D. B. Irving, chairman of the London Electricity Board. Following the dinner there was dancing and an excellent cabaret.

Non-Destructive Testing

THE third International Conference on Non-Destructive Testing will be held in Tokyo from 15th to 21st March. The conference is intended to provide an opportunity for the exchange of information on the latest developments in scientific research and industrial application in non-destructive testing in different parts of the world and for the discussion of improvements in testing techniques. The conference will also deal with problems of international co-operation.

The main part of the conference will consist of four principal sessions (two in Tokyo and two in Osaka) and a number of technical sessions. A programme of tours and visits to engineering works and research laboratories is to be arranged, and there will be opportunities for visits to places of cultural and historical interest.

NEW ELECTRICAL EQUIPMENT

Central Heating Circulator

The glandless circulator for use in small bore central heating systems announced by the HARLAND ENGINEERING CO., LTD., Harland House, 20, Park Street, London, W.1, incorporates a motor rotor separated from the stator by a non-magnetic stainless steel can, the rotor running in the water being pumped. The rotor and pump impeller are mounted on a stainless steel shaft running in two bearings lubricated by the circulating

Harland central heating circulator

water. The stator can be removed without disturbing any other part of the unit and, if isolating valves are fitted, the rotor and impeller can be removed without draining the system.

The "Kalorite" circulator is supplied in sizes rated from 1 to 160 gal/min operating against heads between 0·5 and 26ft. The smaller units are supplied suitable for connection to a single-phase 200/250 V 50 c/s supply, and the larger sizes are designed for a 400/440 V three-phase 50 c/s supply. The units are finished in high gloss white and are silent in operation.

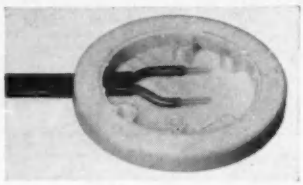
Test Vibrator

An environmental test vibrator suitable for high "g" valve and component testing, extended fatigue tests and accelerometer calibration is now being marketed by E.M.I. ELECTRONICS, LTD., Hayes, Middlesex. Known as the EMV 100A, the instrument has a usable frequency range covering 1-20,000 c/s, and a continuous rating thrust of 120 lb is maintained throughout the range of 30-20,000 c/s. The self-contained vibrator has no anti-resonances and the maximum random table acceleration due to the cooling medium is less than 0·1 g r.m.s.

Universal Moulded Backplate

A recent addition to the range of electrical wiring accessories manufactured by SIEMENS EDISON SWAN, LTD., Woolwich, S.E.18, is a universal moulded backplate which has been devised to enable ceiling roses, batten lampholders, switches, etc., to be installed in compliance with Regulation 207.G of the 13th edition of the I.E.E. Wiring Regulations. This enables the portion of p.v.c. or t.r.s. sheathed cable from which the protective sheath has been removed to be accommodated entirely within an enclosure of combustion-resisting material.

The backplate can receive any



Siemens Ediswan moulded backplate

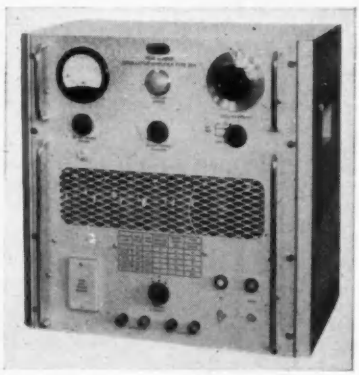
surface-mounting accessory designed to fit on a B.S. 31 small conduit box, i.e. having 2in or less fixing centres for 2 B.A. screws. In addition to knock-outs in the back of the plate displaced at 90° to the fixing centres, four knock-outs are mounted around the circumference for surface wiring in various cable sizes.

Oscillator-Amplifier

Designed basically as a power source for small servomotors, vibrators and "odd-frequency" equipment, the oscillator-amplifier Type 254 announced by AIRMEC, LTD., High Wycombe, Bucks., consists of a power amplifier, giving an output of 150 W up to 800 V, which can be driven from an external signal or from an internal oscillator continuously variable over the range 30 c/s to 30 kc/s. The amplifier may be isolated from the oscillator and used as a public address system or transmitter modulator.

The output stage consists of four EL34 valves in parallel/push pull working into an output transformer

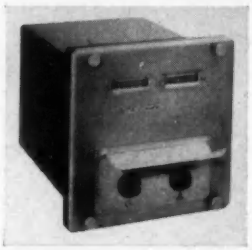
Airmec oscillator-amplifier



with a number of secondary windings, which may be connected in series/parallel arrangements to match a wide range of loads. A meter is fitted to monitor the output voltage. The valves are fully protected by fuses and spark gaps, and a warning lamp is provided to indicate overdriving or excessive anode current. The oscillator employs a Wien bridge feedback network stabilised by a thermistor, and the frequency is indicated on a dial to an accuracy of ±2 per cent.

Printing Counters

A range of counters which print out indications of count and time on paper roll has been introduced by the STONEBRIDGE ELECTRICAL CO., LTD., 6, Queen Anne's Gate, London, S.W.1. The counters can be arranged as single or double units. The single units are normally of the six digit totalising type with electrical impulsing, printing and zero reset. Double units may be fitted with two such totalising units or one totalising and one unit giving date and time information. The maximum impulsing rate is 10 per second, printing is carried out in 100 millisec and the



Stonebridge Electrical printing counter

reset time is 500 millisec. Models are available for operation from various a.c. or d.c. voltages.

Speed Regulator

A speed regulator introduced by WESTOOL, LTD., St. Helen's Auckland, Co. Durham, employs eddy currents to transmit torque. It comprises a stator with a stationary field coil in which an annular rotor attached to the driven load and a central rotor driven by a prime mover rotate. With no current flowing in the field winding, the input shaft and rotor run idle while the annular rotor remains stationary. When d.c. is fed into the field winding, the magnetic field created causes the annular rotor and the output shaft to rotate at a speed depending on the exciting current and the torque to be supplied.

The "Elcotron" regulator is suited to remote control applications as a comparatively low power controlling the excitation of the regulator is required, e.g. 1 kW can handle a

transmitted power of 200 h.p. Its speed can be manually or automatically controlled and infinite variation from zero to just below the speed of the driving motor can be obtained by using it in conjunction with a fixed speed squirrel cage induction motor. Both the output speeds and torque can be held automatically constant at any desired level irrespective of load changes.

Variable Transformer

A variable transformer for use on a 240 V 50 c/s supply and providing an output continuously variable from 0 to 270 V at a nominal current of 20 A has been added to the Philips range of transformers distributed in this country by RESEARCH & CONTROL INSTRUMENTS, LTD., Instrument House, 207, King's Cross Road, London, W.C.1. Grain-oriented strip wound

Philips 20 A variable transformer

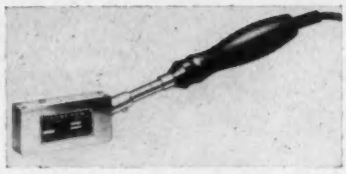
cores have been used to reduce dimensions, and a multi-brush, self-aligning contact coupled with a silver alloy coated track is incorporated to minimise oxidation. The type E401/200 transformer is obtainable in enclosed or skeleton versions for bench or panel mounting, motor driven if required. Units may be coupled for series, parallel or three-phase use.

Square Flanged Instruments

The range of square flanged meters introduced by SANGAMO WESTON, LTD., St. George's Court, 22-26, New Oxford Street, London, W.C.1, are basically permanent magnet, moving coil, d.c. instruments with applications as microammeters, milliammeters and voltmeters. In conjunction with a vacuum thermocouple they can be used as h.f. milliammeters, and for a.c. measurements a rectifier can be incorporated. Models are available in 2½, 3$\frac{3}{16}$ and 4½in square cases and ranges of 25 μA, 500 mA, 300 and 500 V d.c., and 100 μA, 10 and 20 mA and 100 and 500 V a.c. When fitted with a thermocouple, h.f. currents between 10 and 200 mA can be recorded. The pointer zero adjuster fitted on the front of the case is recessed and 4 B.A. connecting terminals are incorporated.

Plastic Sealing Tool

The latest addition to the range of electric soldering irons and small



Hancock & Eccles plastic sealer

heaters manufactured by HANCOCK & ECCLES (ELECTRICAL), LTD., Stourport, Worcs., is a hand tool for sealing plastic sheet. The heating element is controlled by a thermostat which can be adjusted to suit various grades of sheeting, the temperature being variable between 60 and 160°C. Models are available for operation from a.c. supplies up to 250 V, and the price, including 6ft of three-core t.r.s. flexible cable and a stand, is £5 5s.

Impregnation Monitor

Instruments in the range of impregnation monitors introduced by the ADDISON ELECTRIC CO., LTD., 10-12, Bosworth Road, London, W.10, comprise a four-point servo-operated recorder and an electronic measuring unit. Records are provided throughout a vacuum impregnation and drying process of four quantities, each having a distinctive coloured trace. The measurement of insulation resistance from 1 to 10,000 MΩ, indicating occluded moisture, is carried out by a circuit stabilised against supply voltage fluctuations and changes in valve characteristics. The test potential does not exceed 200 V d.c. The record of self-capacitance from 0·01 to 5 μF indicates air and gas remnants trapped in the insulation and hence the degree of impregnant penetration.

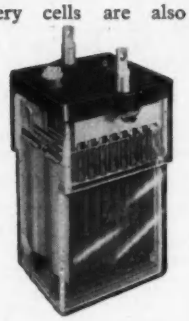
The measurement is carried out at mains frequency with a test potential of approximately 30 V. Temperature between 0 and 200°C is measured by a thermocouple, a thermistor controlled bridge circuit providing ambient temperature compensation, and vacuum between 0·005 and 10 mm Hg is measured by a hot wire Pirani gauge. The recorder operates from a 200-250 V 40-60 c/s power supply and has a consumption of 100 W.

High Performance Cells

A number of new high performance cells have recently been announced. Those manufactured by PRITCHETT & GOLD AND E.P.S. CO., LTD., 137, Victoria Street, London, S.W.1, are of the Planté type in sealed glass boxes and are suitable for stationary duties in applications not requiring frequent substantial discharges. The compact cells embody positive plates of a large developed area and lattice grid type negative plates.

A saving in space of up to 50 per cent compared with cells made to B.S.S. 440, and a consequent weight reduction, is a feature of the cells announced by CHLORIDE BATTERIES, LTD., Exide Works, Clifton Junction, Swinton, Manchester. They have a lower internal resistance and improved performance at high discharge rates ranging from an increase of approximately 14 per cent at the one hour rate to 100 per cent at the 3 sec rate. The new range includes 14 cell sizes with capacities between 15 and 400 Ah at the 10 hour discharge rate.

Traction battery cells are also



Chloride high performance cell

announced by Chloride Batteries, Ltd., giving up to 35 per cent more power for a given space and weight. The tubular positive plates have a multi-tubular "gauntlet" of resin-impregnated "Terylene" cloth which holds the active material in a firm but elastic grip. The cloth is resistant to sulphuric acid and oxidation, combines high tensile strength with elasticity and contains no corrosive agents to attack the metal of the plate spines. The gauntlet reduces the shedding of active material yet permits free penetration of the electrolyte. The negative plates are armoured with sleeves of "Porvic" and combined spray arrestors and separator guards moulded in polystyrene are incorporated.

Two versions of their "Tudor" high performance cells, types HP and HPX, are announced by the DP BATTERY CO., LTD., Bakewell, Derbyshire. The HP type is intended for applications where the discharge rate is lower than the 1-hour discharge rate of the battery. These cells have antimonial lead terminal pillars. The HPX type is intended for such high discharge rate applications as switch closing and engine starting and these cells have tinned copper terminal pillars.

Also announced by the DP Battery Co. is the Kathanode "N" range of traction battery cells having an improved capacity/weight ratio. The cells incorporate pasted positive and negative plates and triple separation consisting of ribbed "Porvic," glass wool sheets and cedar veneers. Patented plate edge insulation is provided to prevent internal short circuits.

Financial Section

STOCKS and SHARES

WHILE the amount of business being transacted in the industrial markets of the Stock Exchange has become more manageable than was the case in the few days either side of the General Election, it continues to run at a rate well above the normal. Since share prices have risen on the average by practically half-a-crown in the pound since the first announcement of polling day, selling to consolidate capital profits has continued on a heavy scale, yet has so far made only temporary impressions on the weight of money coming into the market for new investment.

Further Gains

By the beginning of this week shares of several of the major electrical groups had added a shilling or so to the larger gains recorded as a first reaction to the Election result. A.E.I. moved up to 66s 3d and G.E.C. to 48s. Crompton Parkinson at 17s were again well supported in anticipation of the dividend declaration and annual results expected next Thursday (29th October). C. A. Parsons at 55s and A. Reyrolle at 93s 9d gave up a little of previous advances, but elsewhere there were improvements of 1s to 2s in a number of shares, including Automatic Telephone, Hoover, Westinghouse, Brook Motors, Watford, Aberdare, and Hackbridge & Hewittic. In the radio group, Decca "A" were another 2s 6d to the good at 42s 6d, while Pye at 19s and E. K. Cole at 24s both moved up to the extent of a further shilling.

Other Changes

Demand persisted for shares associated with the motor car industry. In Chloride Electrical, which had risen 3s 9d in the previous week, there was a further advance of 5s 9d to 67s, and Lucas rose 3s 9d to 61s 3d; the latter company's annual results and final dividend for the year ended in July will be due next month. Another rise in British Electric Traction "A" shares to 46s reflected in part the post-election revival of optimism about prospects for commercial television, in which field B.E.T. is interested through its large investment in Associated-Rediffusion. Among the most notable of other changes in the electrical lists were gains of 7s in Plessey to 44s 6d, and of 6s 6d in Berry's Electric Magicoal to 28s 9d.

Morphy-Richards Dividend

After some fluctuation around the time of the dividend declaration, Morphy-Richards 4s shares had a net gain of about 1s 6d at 31s 6d. The increase in the total distribution to 25 per cent, or 5 per cent more than before, was much in line with expectations based on the raising of the interim payment in March. At that time shareholders were advised of a 25 per cent expansion of turnover—mainly in the Astral subsidiary's refrigerators and spin dryers—and of some improvement in profit margins on the parent company's products. For the full twelve months, ended in June, the improvement in the trading

Price Changes in

Company or Board	Nom. Value	Middle price 19th Oct.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield %	1959 Highest	1959 Lowest
Gilt-edged Stocks						£ s d		
Brit. Elec. 1968/73	100	79½	+1	3	3	3 15 6	80½	77½
Brit. Elec. 1974/77	100	76	+1	3	3	3 19 0	77	74½
Brit. Elec. 1976/79	100	79	+1	3½	3½	4 8 6	80½	77½
Brit. Elec. 1974/79	100	89½	+1	4½	4½	4 15 0	91	87½
Overseas Electric Supply								
Calcutta Elec.	£1	19/6	+1/-	6·8†	7†	11 15 0	19/6	16/-
East African Power	£1	20/-		7½	8	8 0 0	22/3	19/3
Nigerian Elec.	£1	14/6	+6d	8	8	11 0 9	15/-	13/-
Perak Hydro-Elec.	£1	14/6		12½	10	13 15 9	15/-	12/3
Electrical Shares								
Aberdare Holdings	5/-	18/3	+1/-	17½	17½	4 16 0	18/3	15/6
Aerialite	1/-	10/6		51½	54	5 2 9	10/6	7/9
Allen, W. H.	£1	52/6		11	12	4 11 6	52/6	43/-
Allied Insulators	5/-	21/-		—	20‡	4 15 3	21/6	18/9
Anglo-Portuguese Tel.	£1	30/6		9	9	6 4 3	30/9	26/6
Aron Elec. Ord.	£1	50/-	−1/3	15	15	6 0 0	62/6	50/-
Assoc. Elec. Ord.	£1	66/3	+1/6	15	15	4 10 6	67/-	53/9
Automatic Tel. & El.	£1	78/9	+1/3	17	17‡	4 6 3	82/6	71/3
Babcock & Wilcox	£1	52/6		13½	13	4 18 9	52/6	45/6
Bakelite	10/-	33/9		15	15	4 9 0	34/-	22/-
Baldwin, H. J.	2/-	2/3		20	—	—	3/-	2/3
Berry's Electric	5/-	28/9	+6/6	10	20‡	3 9 6	28/9	7/3
Bowthorpe Holdings	2/-	10/9x.c.	+9d	25	27	3 0 6*	10/9	8/-
British Elec. Traction: Def. Ord. "A"	5/-	46/-	+2/-	25	35	3 16 0	46/-	35/6
B.I. Callender's	£1	57/-	−6d	12½	13½	4 14 9	58/6	44/9
B.I. Callender's 6% Pref.	£1	20/6		6	6	5 17 0	20/6	19/9
British Thermostat	5/-	23/9	+2/3	30	35	3 13 9*	28/-	18/6
British Vac. Cleaner	5/-	8/3	+3d	10	7½*	4 11 0	8/3	4/6
Brook Motors	10/-	56/3	+2/3	25	24½*	4 5 9	56/3	46/-
Bulgin, A. F.	1/-	11/6		45	50	4 7 0	11/6	6/9
Bulpitts	5/-	18/9	+9d	—	15	4 0 0	18/9	10/-
Burco Dean	5/-	17/3	+6d	22½	16*	4 12 9	17/3	12/3
Cable & Wireless: Ord.	5/-	18/-	+6d	10	10*	2 15 6	18/-	12/3
4% Loan	100	94½		4	4	4 4 9	95	93
Chloride El. Storage "A"	£1	67/-	+5/9	17½	20‡	3 19 9*	67/-	43/8
Clarke Chapman	£1	57/6	+2/6	27½	13‡*	4 15 9	66/3	52/6
Cole, E. K.	5/-	24/-	+1/-	17½	20	4 3 3	24/-	17/3
Contactor Switchgear	5/-	16/-		20	14*	4 7 6	16/3	12/-
Cossor, A. C.	5/-	7/6	−3d	Nil	5	3 6 9	9/-	6/3
Crabtree	10/-	34/-	+1/-	20	20	5 17 9	34/-	28/-
Crompton Parkinson	5/-	17/-	+9d	16	12*	3 10 6	17/-	11/9
Davis & Timmins	5/-	19/-	+6d	18	20	5 5 3	19/-	14/6
De La Rue	10/-	56/3		17½	20	3 11 0	56/3	30/3
Decca "A"	10/-	42/6	+2/6	43‡	50	4 14 3*	42/6	33/3
Desoutter	5/-	30/-	+1/6	32½	21‡*	3 12 3	30/-	19/-
Dewhurst	2/-	8/9		20	20	4 11 6	8/9	7/3
Dictograph Tel.	2/-	8/9	+6d	20	20	4 11 6	8/9	7/-
Dubilier Condenser	1/-	4/9	+3d	20	25	5 5 3	5/-	3/3
Duport	5/-	16/-		25	12½*	3 18 3	16/-	10/3
E.M.I.	10/-	58/-	+1/9	15	20*	3 9 0	64/6	48/-
Electrical Apparatus	5/-	16/6		14½	14½	4 8 0	16/6	13/-
Electrical Components	5/-	17/3	+6d	12½	15	4 7 0	17/3	10/6
Elec. Construction	£1	36/-	+2/-	8½	9	5 0 0	36/-	27/9
Elliott-Automation	5/-	26/-		—	10‡	1 18 6	30/6	16/9
English Electric	£1	48/3	−6d	14	14	3 17 6*	48/9	37/10
English Electric 3½% Pref.	£1	13/-		3½	3½	5 15 6	12/9	12/3
Ericsson Tel.	5/-	25/-		12†	13†	4 5 6	27/3	22/3
Ever Ready	5/-	27/6	−6d	20	27½‡	3 0 0*	28/-	13/3
Falk Stadelmann	£1	26/-		17½	10*‡	7 13 9	32/9	25/-

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.
* After scrip issue. † Free of income tax. ‡ Dividend indicated.

profits of the group is now shown to have been of the order of 30 per cent. After heavier charges for tax and depreciation, the net surplus comes out more than £100,000 to the good at £323,000, giving approximately 2½ times cover for the new rate of dividend.

A yield of three guineas per cent shows the popularity of shares connected with "consumer durable." goods.

Vactric

Some sharp movements were recorded in Vactric shares at around 44s (with the "A" shares at 42s 6d) as a result of statements which revived discussion on the question of an offer for the shares. This originated earlier this year when a bid from Arusha Industries was rejected on the grounds that it failed to recognise the group's earning potential. It was referred to again by Mr. W. C. Pegley at last week's annual meeting, where further discussions were said to have taken place with Arusha and also with other interested parties. Subsequently there was a statement from Arusha to the effect that talks with that company had ended. Vactric's chairman told shareholders that they would be kept well informed. He anticipated meanwhile a continued growth of the business and hoped to see a satisfactory increase in turnover and profits. For the past year the profits of the present members of the group (excluding the Awley Finance and Canadian subsidiaries now sold) were more than doubled.

Electrical Investments

Company or Board	Nom. Value	Middle price 19th Oct.	Week's Rise or Fall	Dividend Previous	Dividend Last	Yield % £ s d	1959 Highest	1959 Lowest
Electrical Shares—continued								
G.E.C.	£1	48/-	+2/-	10	10	4 3 3	48/-	31/3
G.E.C. 6½% Pref.	£1	22/-		6½	6½	5 18 3	22/-	20/3
General Cables	5/-	7/9	−6d	24	15	9 13 6	9/3	7/6
Greenwood & Batley	£1	108/-	+3/-	20	30	5 11 0	108/-	75/-
Hackbridge Holdings	5/-	19/3	+9d	20	20	5 4 0	19/3	14/3
Hackbridge & Hewittic	5/-	15/-	+1/6	20	20	5 0 0*	15/-	10/6
Head Wrightson	5/-	37/-	−6d	17½	20*	2 14 0	38/-	24/3
Heatrae	2/-	10/-		20	20	4 0 0	10/-	7/6
Holophane	5/-	18/3		22½	26	7 2 6	18/9	14/9
Hoover	5/-	88/9	+1/3	50	60	3 7 6	90/-	55/-
I.C.I.	£1	54/6	+1/3	12	8*	2 18 9	54/6	33/-
Incl. Combustion	5/-	38/3		25	30‡	3 18 6	38/6	29/9
Intl. Computers & T.	£1	71/3		—	8‡	2 5 0	78/9	57/6
Johnson & Phillips	£1	21/6		5	5	4 13 0	30/6	20/-
Lancashire Dynamo	£1	46/3	+1/3	11	12½‡	4 1 0*	46/3	31/6
Laurence Scott	5/-	18/-	+9d	15	15	3 11 9*	18/-	14/-
Lister, R. A.	£1	47/6	+4/-	10	12½	5 5 3	47/6	32/9
Lucas, J.	£1	61/3	+3/9	7½	10‡	3 5 3	61/3	43/3
Marconi Marine	£1	42/-	−1/-	10	10	4 15 3	48/6	40/-
Marryat & Scott	2/-	11/-	+1/-	37½	22½*	4 1 9	11/-	8/6
Mather & Platt	£1	50/-	+2/-	15	10‡*	4 5 6	51/6	41/3
Metal Industries	£1	61/6	−1/-	14	14	4 11 0	62/6	39/9
Midland Elec. Mfg.	£1	47/6	+1/3	12½	10*	4 4 3	47/6	41/6
Morphy-Richards	4/-	31/6	+1/6	20	25	3 3 6	34/-	18/-
Murex	£1	57/6	+2/6	17½	15	5 4 3	57/6	42/-
Newman Ind.	2/-	3/3		10	10	6 3 0	3/6	2/3
Oldham & Son	1/-	3/-	−3d	17½	17½	5 16 9	3/3	2/6
Parsons, C. A.	£1	55/-	−1/3	7½	8½‡	2 19 6	58/-	45/9
Philips' Lamps	Fl.10	122/6		14	14	2 3 0	130/-	88/-
Plessey	10/-	44/6	+7/-	30	14*‡	3 3 0	44/6	23/6
Pye	5/-	19/-	+1/-	12½	12½	3 5 9	19/-	13/9
Pyrotenax	5/-	42/-	+9d	—	34	4 1 0	42/-	33/9
Reliance Clifton	5/-	24/-		15	15	3 2 6	24/-	17/6
Reyrolle	£1	93/9	−2/9	17½	17½	3 14 9	98/-	85/9
Rheostatic	4/-	11/3	+1/-	12½	12½	4 8 9	11/3	8/3
Richardsons Westgarth	10/-	12/9		8½	8½	6 10 3	15/3	11/6
Simon-Carves	5/-	31/3		25	25	4 0 0	32/-	28/6
Smith (England), S.	4/-	19/3		20	12½*‡	2 12 0	20/-	11/6
Southern Areas	£1	14/-		Nil	Nil	Nil	15/-	10/6
Strand Elec.	5/-	12/3		15	20	8 3 3	12/3	8/6
Sturtevant	5/-	20/-	+1/-	15†	15†	6 2 6	20/-	17/-
Sun Elec.	5/-	15/9		25	25	3 19 3*	16/9	8/3
Switchgear & Cowans	5/-	13/9	+3d	22½	15*	5 9 0	13/9	10/3
T.C.C.	10/-	52/6	+2/6	25	25	4 15 3	52/6	38/-
Telephone Mfg.	5/-	7/-	−3d	10	10	7 2 9	7/3	4/9
Telephone Rentals	5/-	18/-	+6d	12½	12½*	3 9 6	18/-	11/9
Thompson (John)	5/-	20/-		25	25	6 5 0	25/6	20/-
Thorn Elec.	5/-	42/-	+6d	17½	20	2 7 6	42/-	26/3
Thornycroft	£1	25/-		12½	7½	6 0 0	30/-	20/6
Tube Investments	£1	106/3		15	17½	3 5 9	110/-	71/6
Vactric	5/-	44/-	−1/-	25	37½	4 3 3	46/6	26/3
Veritys	5/-	1/6		12½	2½	—	5/-	1/3
Walsall Conduits	4/-	13/9	+6d	22½	22½	3 14 9*	14/2	10/8
Ward & Goldstone	5/-	49/-		25	30	3 1 3	50/-	30/6
Watford	2/-	13/-	+1/3	25	25*	3 17 0	13/-	7/6
Westinghouse	£1	53/9	+1/3	10	10	3 14 6	53/9	39/6
West, Allen	5/-	13/9	+6d	12½	11½*	4 5 0	13/9	11/9
Wolf Electric	5/-	9/3		10	10	5 8 0	9/3	7/9

Bowthorpe Issue

The 2s shares of Bowthorpe Holdings are now quoted ex the scrip issue of two new shares for every three old, which raises the issued ordinary capital to a million. In the new form the price moved up to 10s 9d, with the new shares a little higher by virtue of being transferable free of stamp duty. For last year the company paid dividends (including a special interim) totalling 27 per cent, covered the best part of four times over by earnings. Last month the interim payment was raised, with the proviso that the decision should not be assumed to imply a larger total for the current year. Profits for the first six months were said to have equalled approximately one half of those earned for the full period of 1958, while the rate of turnover and new orders was described as satisfactory. Scaled down in proportion to the scrip issue, last year's dividend is equivalent to about 16½ per cent on the present capital.

Company News

At the annual meeting of Christy Bros., held early this month, the chairman told shareholders that last year's turnover exceeded the million mark for the first time. Because of lower margins trading profits were lower, but after a reduced tax charge the net surplus was little down on the previous figure and the ordinary dividend has been raised to 8 per cent, a point more than the rate paid for the seven preceding years. The distribution is covered 2¾ times by the net profit, and gives a yield of 5¾ per cent on the £1 shares at a price of 27s 6d. Electrical Apparatus report lower earnings but are maintaining the dividend at a total of 14½ per cent; the 5s shares remained at 16s 6d. H. J. Baldwin have decided to pay no final dividend for the last period, but to consider an interim payment when results for the six months ending this month are known.

REPORTS and DIVIDENDS

Vactric, Ltd.—In the course of his speech at the annual meeting held on 13th October, Mr. W. C. Pegley (chairman) said that, as had been previously announced, the take-over bid from Arusha Industries, Ltd., was refused as the directors were of the opinion that it did not take fully into account the earning potential of the group. Further talks had taken place with Arusha Industries and other interested parties, and shareholders would be kept informed of any further developments of a positive nature.

The board of Arusha Industries later announced that all negotiations for the acquisition of the ordinary shares of Vactric were at an end and that no negotiations were now proceeding with a view to an offer being made for the shares of that company.

Stothert & Pitt, Ltd.—The accounts for the year ended 30th June last show group profits of £911,060, as compared with £1,024,422 for the previous year, but after a lower taxation charge of £412,200, the net profit is £498,860 (against £493,172), plus unrequired tax provision of £40,946. General reserve receives £250,000, and a special bonus totalling £57,000 is paid to employees. With a final payment of 15 per cent, the ordinary dividend for the year is raised from the equivalent of 18¾ per cent to 20 per cent, allowing for the one-for-three scrip issue in October last. The balance carried forward is £182,974 (against £197,245 brought in).

Morphy-Richards, Ltd.—The group trading profit for the year ended 30th June last amounts to £851,075, as compared with £656,033 for the preceding year, and after meeting all charges, including £351,961 for United Kingdom and overseas taxation, the net balance is £322,837 (against £218,433). It is proposed to pay a final ordinary dividend of 15 per cent, making 25 per cent for the year (against 20 per cent), and to carry forward £415,991 (against £319,577 brought in).

Phœnix Telephone & Electric Holdings, Ltd.—The annual meeting was held on 16th October, Mr. G. F. Shipman (chairman) presiding. In his statement, which had been previously circulated, the chairman said that the financial results for the year ended 28th February last were disappointing, the net profit amounting to only £2,337. The main cause of this severe setback was a continued deficiency in Post Office orders, on which the Phœnix group had relied to a substantial extent for many years. There was now some indication of a modest upward trend in the volume of Post Office orders, although these were not due for delivery until after the end of the current financial year. For some time past the directors had realised that from a long-term point of view it was essential for the group to widen its activities, either by itself developing new lines of output or by acquiring existing businesses in different fields. In his last statement he mentioned that the directors were seeking to put into effect such a policy, but an unexpected setback was experienced some months ago in that respect. They were continuing their efforts in that direction and he hoped that this time next year it would be possible to report significant progress towards widening the group's activities. The manufacturing unit which was established some years ago in South Africa was expanding steadily.

Scottish Cables (South Africa), Ltd., reports trading profits for the year ended 30th June last of £134,724, as compared with £170,445 for the preceding year, and after meeting all charges, including £32,000 for taxation, the net balance is £73,836 (against £99,169). It is proposed to pay a dividend for the year of 10 per cent (against 12½ per cent). The balance carried forward is £72,095 (against £58,259 brought in).

Thos. W. Ward, Ltd., report a group profit for the year to 30th June last of £1,442,519, as compared with £1,173,710 for the preceding year. This is struck after providing £1,333,148 for taxation. General reserve receives £600,000 and it is proposed to pay a final dividend of 20 per cent, making 25 per cent for the year (against 20 per cent). It is also proposed to make a 100 per cent scrip issue.

The Electrical Apparatus Co., Ltd., reports a net profit for the year ended 31st July last of £144,000, as compared with £173,505 for 1957-58. Taxation absorbed £113,000. The dividend for the year is maintained at 14½ per cent by a final payment of 10 per cent.

J. & F. Stone Lighting & Radio, Ltd.—The group trading profit for the year to 30th June last declined from £860,678 in the preceding year to £617,121, and the net profit from £309,188 to £280,775. General reserve receives £50,000 and the dividend for the year is unchanged at 30 per cent with a final payment of 20 per cent.

Pifco Holdings, Ltd.—The main figures in the accounts for the year ended 30th April last were given in our issue of 18th September. In his review of the year, which has been issued with the report and accounts, Mr. A. D. Webber (chairman) says that he indicated in his statement last year that the results for the first quarter were not encouraging, but there was a revival of trade in the autumn. The group has continued to build up the popularity in the home market of its range of domestic electrical appliances. Exports do not show any progress, mainly due to import restrictions overseas. The turnover of the company for the first five months of the current financial year is a little ahead of the previous year and the order book is in a healthy condition.

Parkinson Cowan, Ltd., has declared an interim dividend of 5 per cent. Previously single annual payments have been made.

W. Canning & Co., Ltd., are paying an interim dividend of 3½ per cent (against 2½ per cent). It is stated that the increase is to bring the interim and final payments into closer relationship.

The Engineering & Lighting Equipment Co., Ltd., has announced an interim dividend of 5 per cent (unchanged).

Hopkinsons, Ltd., has announced an interim dividend of 7½ per cent (unchanged).

The British Electric Traction Co., Ltd., is paying an interim dividend of 10 per cent (unchanged).

Liquidations

High Level Works (Electrical Engineers), Ltd., Halifax.—Winding up voluntarily for reconstruction purposes. Liquidator, Mr. H. W. Peaston, Carlton House, 14, Bull Close Lane, Halifax, appointed 3rd October. The liquidator has been authorised to enter into an agreement with S. Hodgson & Co. (Halifax), Ltd.

Circuitest, Ltd., circuit testing and electrical engineers, 130, Northfield Avenue, West Ealing, London, W.13.—Winding up voluntarily. Liquidator, Mr. D. C. Sealy-Jones, 130, Northfield Avenue, West Ealing, W.13, appointed 29th September.

Leenket, Ltd., electrical wholesalers, 11, Peter Street, Manchester, 2.—Winding up voluntarily. Liquidator, Mr. G. H. Eaves, 47, Mosley Street, Manchester, 2, appointed 5th October. Particulars of claims to the liquidator by 11th November.

Northern Electrical Servicing Co. (Darlington), Ltd.—Particulars of claims by 9th November to the liquidator, Mr. A. Hopper, 6, Victoria Road, Darlington.

Bankruptcies

L. G. Brown, lately carrying on business at 31a, Colin Road, Luton, Beds., dealer in household and electrical equipment.—Last day for receiving proofs for dividend 26th October. Trustee, Mr. H. C. Hedges, 4, Charterhouse Square, London, E.C.1.

L. J. Wotton, 76, Babbacombe Road, Torquay, radio and electrical engineer.—First dividend of 3s 3d in the £, payable at 50, The Terrace, Torquay.

M. S. Pollard, 16, The Drive, Southwick, Sussex, lately carrying on business at 21, Preston Road, Brighton, electrical dealer.—Receiving order made 8th October on a creditor's petition.

E. Baker, lately residing and carrying on business at 157, Lightbowne Road, Moston, Manchester, under the style of Star Radio & Electric Service, as an electrical contractor.—Receiving order made 9th October on debtor's own petition.

S. G. Cottle, carrying on business as Electro Products Co., at 218, High Road, Willesden, London, N.W.10, electrical retailer.—First meeting 28th October and public examination 26th November, both at Bankruptcy Buildings, Carey Street, London, W.C.2.

W. H. Rosindale, lately carrying on business as an electrical contractor at 12 and 14, Paragon Arcade, Paragon Street, Hull.—Order made 16th September suspending discharge for three months until 16th December.

GENERATION and DEVELOPMENT

Kent Supergrid Decision

A decision has recently been given by the Minister of Power on an application by the Central Electricity Generating Board under section 10(b) of the schedule to the Electric Lighting (Clauses) Act, 1898, for consent to the construction of a 275 kV overhead transmission line between Northfleet and Canterbury. In view of the fact that on one section of the route there was a divergence of views as to whether the route should proceed in a northerly direction, instead of the southerly direction proposed in the application, the Minister deferred his decision on this section of the route and sought further information. As a result the unusual situation arose of two inspectors (one a senior inspector of the Ministry of Housing and Local Government, the other the chief engineering inspector of the Ministry of Power, Mr. H. W. Grimmitt) expressing different opinions on the amenity issues.

In reaching his final decision the Minister, while weighing up the amenity considerations, felt bound to take into account the extra cost, amounting to £665,000, and the risk of interruption of electricity supplies during the extra construction period that the northern route would involve. In these circumstances he gave consent to the route proposed by the Board, although opposed by the local planning authority, with a condition requiring the use of a landscape artist to study the siting of individual towers.

300 MW Turbo-Alternators for West Thurrock

A contract worth nearly £5 million has been awarded to the Turbine-Generator Division of Associated Electrical Industries, Ltd., by the Central Electricity Generating Board. It covers the supply and erection of two 300 MW turbo-alternator units, complete with feed water heating equipment, for West Thurrock generating station which is now under construction. This power station will ultimately have a capacity of 1,000 MW and when it is in full operation the coal consumption will be about 3¼ million tons a year.

Each generating unit will have the greatest single-line output in the world at 3,000 r.p.m. and will consist of a four-cylinder turbine directly coupled to the generator; the exciters are gear driven from the generator shaft. Seven stages of feed water heating are employed to give a final feed temperature of 485°F. The steam conditions at the turbine stop valve are 2,300 p.s.i. and 1,050°F. After expanding through the h.p. stages the steam is reheated to 1,050°F, before entering the l.p. cylinder from which it is conducted through four overhead pipes to the two double flow l.p. cylinders.

The generating voltage is 16·5 kV. The stator windings will be water cooled while the rotor windings will be direct cooled by hydrogen at 30 p.s.i. To keep the overall dimensions and weight of the machine within the limits dictated by transport considerations, the end bells containing the coolers will be transported separately from the core and assembled on site.

Recent C.E.G.B. Contracts

The Central Electricity Generating Board has placed contracts during the past month for power stations, transmission lines and transforming stations amounting in the aggregate to approximately £4,140,000. They include the following:—

Berkeley research laboratory: Active material handling equipment.—H. M. Hobson. Main building and civil engineering.—Balfour, Beatty & Co.

West Thurrock power station: 415 V, 31 MVA switchgear and contactor control gear for Nos. 1 and 2 sets.—South Wales Switchgear.

Drakelow "B": Main and auxiliary control and instrument cables and accessories.—British Insulated Callender's Cables.

Thorpe Marsh: Main circulating water pumps and motors for No. 1 set.—Drysdale & Co.

Stuart Street substation: One 60 MVA, 132/33 kV transformer.—Ferranti.

Wold Newton substation: 132 kV and 33 kV connections.—Associated Electrical Industries.

Stafford substation: 132 kV cables.—Pirelli-General Cable Works.

Keadby substation: Civil engineering works.—Henry Boot & Sons.

Stalybridge-Stockport Overhead Line

An inquiry was held at Mottram, Cheshire, on 6th October into a proposal by the Central Electricity Generating Board to erect a 275 kV line from Stalybridge to Stockport. Mr. J. Cook, for the Board, said that the erection of the line was part of a scheme for reinforcing electricity supplies to the district east and south-east of Manchester, including Stalybridge, Stockport, Macclesfield and New Mills, where the present 132 kV line was becoming inadequate. Only the Longendale Council had objected. If the supply were put underground as the Council suggested it would cost another £650,000. In addition to representatives of Longendale Council, speakers against the proposal included Mr. F. Head (Peak District and Northern Counties Footpaths Preservation Society) and Mr. L. Meadowcroft (Ramblers' Association). Mr. Meadowcroft said that the view of Hollingworth Hall Moor and Shaw Moor from Stalybridge was already a festoon of transmission lines, there being no fewer than six separate sets, three of which traversed the skyline. It was here that a seventh was now proposed, crossing Harrop Edge to enter the lovely part of Longendale between Broadbottom and Compstall.

High Marnham Commissioned

On 15th October the first of five 200 MW turbo-alternator/boiler units was commissioned in the High Marnham generating station of the Central Electricity Generating Board. (An illustrated description of this plant appeared in our issues of 22nd and 29th August, 1958.) The 200 MW turbo-generator which has been commissioned was supplied by the English Electric Co., Ltd.; it is the largest machine running in this country, and is believed to be the most powerful in Europe. The steam conditions at the turbine stop valve are 2,350 p.s.i. and 1,050°F with reheat to 1,000°F. The associated boiler was supplied by International Combustion, Ltd., and is the first unit to be employed in Great Britain which embodies the principles of controlled and assisted circulation. The steam conditions at the boiler stop valve are 2,450 p.s.i. and 1,060°F, the reheater outlet temperature being 1,005°F.

Kincardine Generating Station

The second 120 MW set at Kincardine generating station (South of Scotland Electricity Board) was synchronised on 29th September and will be in commercial operation by the end of this month. A third 120 MW set will follow in 1960 and the station will be completed in 1963 by the installation of two 200 MW sets, making the installed capacity 760 MW.

Freedom of Choice

Tenants of Council houses at Gateshead, Co. Durham, are to be given the choice of gas or electricity for cooking. The decision follows a claim by the North Eastern Electricity Board that as the tenants on some estates had not been allowed to choose between gas and electricity the Council should pay £7,761 towards the cost of supplying electricity to these estates. The Board offered, however, to provide mains free of charge if tenants were allowed to make their own choice.

The borough treasurer reported to the Council that it cost between £50 and £70 per house to supply electricity and if the Council had to meet this the loan charges would be between £3 and £4 per house annually. A

large part of the expenditure on maintenance work for electric cookers, he said, was due to negligence on the part of the tenants. In the case of gas cookers there were no maintenance charges, the cost being included in the gas tariff. He added, however, that during the past five years gas charges had gone up by 40 per cent, compared with only 12 per cent for electricity.

Concessions for Pensioners?

At the quarterly meeting of the North Eastern Electricity Consultative Council at Newcastle-on-Tyne it was suggested that the Board should make a price concession to old age pensioners, and the chairman, Mr. D. G. Brown, said he would submit the idea to the Board. Mrs. R. M. Pearson complained that existing tariffs operated unfairly against small consumers such as pensioners, and although she recognised the need for standardisation, she thought some relief should be granted to pensioners.

Off-Peak Heating Campaign

The Eastern Electricity Board has arranged an exhibition of off-peak heating appliances, including floor warming, which it is hoped will result in the greater use of electricity at off-peak times. At the exhibition's debut at Aylesbury the district manager, Mr. F. Bent, had invited an audience of well over a hundred people representing local authorities, builders and architects to hear Mr. R. Charles, of the Chilterns Sub-Area, talk about off-peak use and particularly about floor warming, and a measure of the interest shown was the number and the variety of the questions which followed the talk to which replies were given by Mr. Charles and Mr. L. Shepherd, the Board's heating engineer. Two films, one dealing with the erection of all-electric flats in Bedford and the other with the installation of floor warming in a Suffolk church, were shown. The exhibition will tour the Chilterns Sub-Area during the coming weeks and will be seen at Luton, Berkhamsted, Bedford and Watford.

Mussel Congestion

The Tir John generating station of the Central Electricity Generating Board at Swansea closed down last week-end to allow an accumulation of mussels and other sea creatures to be cleared from the ¾-mile long tunnel through which cooling water is drawn from the King's Dock. The operation took three days but there was no interruption to the electricity supply in Swansea since power was drawn from the national grid.

Metropolitan Line Improvements

London Transport announces that work started last week on the civil engineering works for the four-tracking of the 6½ miles of the Metropolitan line between Harrow North Junction and Watford South Junction. This is part of the £9 million improvement scheme for the line, which includes electrification from Rickmansworth to Amersham and Chesham and the provision of new electric rolling stock for all Amersham, Chesham and Watford trains.

Output in Uganda

During the first nine months of this year 255·1 million kWh was generated by the Uganda Electricity Board (including 93·9 million kWh exported to Kenya), compared with a total of 202·9 million kWh in the same period of 1958, an increase of 25·7 per cent. The increase for Uganda alone was 15·6 per cent.

ILLUMINATING ENGINEERING SOCIETY

Presidential Address and Awards

IN his inaugural address last week as president of the Illuminating Engineering Society, Mr. H. G. Campbell considered some of the mechanical advancement which has taken place during the past fifty years as opposed to the purely scientific and electrical engineering aspect of the interests of members. He described life in this country as it was fifty years ago when the I.E.S. was first founded. This was the era of the Model "T" Ford car and generally illumination in the home was by means of oil lamps, although some large dwellings were lit by gas and very few by electricity.

Mr. H. G. Campbell delivering his presidential address

He then referred to the aeroplane and traced its development as an illustration of some of the technical advances that had been made during the past fifty years. Mr. Campbell thought that it was the finest, and possibly the only, example of a piece of modern machinery which utilised to the full every new invention and discovery and, as such, it proved to be something of a catalyst in that it set up a chain of reactions throughout all other industries. He concluded by saying that in the field of illuminating engineering we had progressed from carbon lamps to tungsten lamps, mercury lamps and fluorescent lamps and now had in view the atomic lamp.

To mark the occasion of its golden jubilee, the I.E.S. has instituted an award to be known as the I.E.S. Gold Medal, which will be bestowed at intervals of not less than two years for outstanding contributions to the advancement of lighting. Recipients of the medal may be of any nationality and need not be members of the Society. At last week's meeting of the Society the first award of the Gold Medal was made to Dr. J. W. T. Walsh, O.B.E., an authority on illumination and photometry, who for many years until his retirement in 1951 was a principal scientific officer in the Electricity Department of the National Physical Laboratory.

Dr. J. W. T. Walsh (left) receiving the gold medal of the I.E.S. from Mr. C. C. Smith, the immediate past-president

Honorary membership of the Society has been conferred upon Mr. A. W. Beuttell in recognition of his valuable services to the Society and particularly for his original work on which the I.E.S. Code was based. Mr. Beuttell joined the Society in 1910. He is governing director of Linolite, Ltd.

The Leon Gaster Memorial Premium of the Society for 1959 has been awarded to Dr. R. G. Hopkinson and Mr. J. Longmore (both of whom are with the Building Research Station of D.S.I.R.) for their paper entitled "The Permanent Supplementary Artificial Lighting of Interiors."

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2

1954

29916. Mullard Radio Valve Co., Ltd.—Semi-conductor diodes. 12th August, 1955. (820611.)

32710. Solus Electronic Tubes, Ltd.—Electro-acoustic transducer. 11th November, 1955. (821131.)

33183. British Thomson-Houston Co., Ltd.—Audio electronic amplifiers. 5th December, 1955. (820482.)

36669. Electric & Musical Industries, Ltd.—Variable reactances for microwaves. 25th November, 1955. (820483.)

37390. English Electric Co., Ltd.—Electric control systems. 16th December, 1955. (820561.)

1955

2554. British Thomson-Houston Co., Ltd.—Control electrodes for gas-filled electric discharge devices. 19th January, 1956. (820885.)

4997. Electric & Musical Industries, Ltd.—Microwave pulse generating circuits embodying magnetrons and magnetrons for use therein. 26th January, 1956. (820791.)

5985. Electric & Musical Industries, Ltd.—Manufacture of electrode structures. 27th February, 1956. (820484.)

10967. British Thomson-Houston Co., Ltd.—Electrical waveguide systems. 13th April, 1956. (820543.)

14977. British Thomson-Houston Co., Ltd.—Rectifier circuits. 24th May, 1956. (820615.)

18822. Thompson & Co. (Sunbury), Ltd., and Benford, P. R.—Protective cut-out for electric immersion heaters. 24th May, 1956. (821024.)

19054. Jackson Electric Stove Co., Ltd.—Electric cooking hotplates. 2nd July, 1956. (820616.)

21897. General Electric Co., Ltd., and Ramsay, D. A.—Bobbins for use in electrical apparatus including laminated ferromagnetic cores, and such apparatus. 27th July, 1956. (820793.)

22071. Mullard Radio Valve Co., Ltd.—Ultrasonic delay lines. 27th July, 1956. (820937.)

23713. Pye, Ltd.—Tuned circuit arrangements. 10th August, 1956. (820618.)

23953. Stabilising circuit for transistor amplifiers. 10th August, 1956. (820619.)

24249. Philips Electrical Industries, Ltd.—Semi-conductive devices. 23rd August, 1955. (820621.)

25138. Philips Electrical Industries, Ltd.—Methods of determining the magnetic state of ferromagnetic rings and magnetic circuits comprising ferromagnetic rings. 1st September, 1955. (821095.)

25668. General Electric Co., Ltd.—Electric multi-stage amplifiers. 4th September, 1956. (820545.)

26025. Benjamin Electric, Ltd., Fenn, J. J., and Campbell, S. A.—Lighting fittings. 12th September, 1956. (820728.)

27958. British Telecommunications Research, Ltd.—Electrical resistors. 14th August, 1956. (820623.)

30244. Graviner Manufacturing Co., Ltd., and Wilkinson Sword, Ltd.—Electric terminal blocks. 21st January, 1957. (821096.)

30523. Licencia Találmanyokat Ertekesito Vallalat.—Voltage dependent resistors. 25th October, 1955. (820546.)

30536. Metropolitan-Vickers Electrical Co., Ltd.—Diesel-electric and other electrical power transmission systems. 10th October, 1956. (820886.)

32406. Burgess, V. E.—Electric impulse mechanisms for electrifying electrical fences. 12th February, 1957. (821136.)

32841. Radio Corporation of America.—Sintered photoconducting layers. 16th November, 1955. (820547.)

32850. Ions Exchange & Chemical Corporation.—Inter-electrode separators for electric cells. 16th November, 1955. (820487.)

34541. Licentia Patent - Verwaltungs G.m.b.H.—Power transformers for mechanical current convertors. 2nd December, 1955. (820625.)

34560. Philips Electrical Industries, Ltd.—Variable inductors. 2nd December, 1955. (821137.)

34562. Philips Electrical Industries, Ltd.—Self-oscillating circuit arrangements producing sawtooth currents. 2nd December, 1955. (820488.)

35482. Chicago Telephone Supply Corporation.—Combination switch and variable resistor adapted for use with printed wiring. 9th December, 1955. (820851.)

36512. Sangamo Weston, Ltd.—Electrical voltage measuring systems. 20th December, 1955. (820490.)

1956

1435. General Electric Co.—Super-regenerative electric circuit arrangements. 16th January, 1956. (820492.)

1666. Walsall Conduits, Ltd.—Junction boxes for electrical conductors. 18th January, 1957. (820549.)

2006. Compagnie Française Thomson-Houston.—Tuned cavity systems. 20th January, 1956. (820550.)

3327. Mullard Radio Valve Co., Ltd.—Colour television and like systems. 14th November, 1956. (820796.)

3535. Electricité de France Service National.—Protective switchgear systems for polyphase electric power transmission and distributing networks. 3rd February, 1956. (820711.)

4134. Wellman Smith Owen Engineering Corporation, Ltd.—Electromagnetic couplings, dynamometers and brakes. 4th February, 1957. (821052.)

4366. National Research Development Corporation.—Method of and apparatus for electron multiplication. 4th February, 1957. (820736.)

6215. General Electric Co., Ltd.—Manufacture of electric incandescent lamps and similar devices. 28th February, 1957. (820446.)

6234. Didier-Werke A.G.—Electric resistance melting furnaces. 28th February, 1956. (820947.)

7148. Zavody V. I. Lenina Narodni Podnik, Trebin, V., and Hes, J.—Cooling electric locomotive starting rheostats. 7th March, 1956. (820871.)

8938. Manufactures des Glaces et Produits Chimiques de Saint-Gobain, Chauny & Cirey, S.A. des.—Electric insulators. 22nd March, 1956. (821101.)

9777. Electric Depot, Ltd., and Bill, E. H.—Clips for electric conductor bars. 28th March, 1957. (820629.)

10776. General Electric Co., Ltd.—Arrangements including electroluminescent and photo-conductive elements. 8th April, 1957. (820800.)

12916. General Electric Co., Ltd., and Moore, R. C.—Manufacture of waveguide components. 25th April, 1957. (820498.)

13543. Philips Electrical Industries, Ltd.—Circuit arrangements for cathode-ray tube oscillograph apparatus. 2nd May, 1956. (820803.)

14294. Sylvania Electric Products, Inc.—Electric tube socket. 8th May, 1956. (820499.)

15012. Siemens-Schuckertwerke A.G.—Inductive load supply circuits. 14th May, 1956. (821141.)

15255. General Electric Co.—Synchronous electric clocks. 16th May, 1956. (820449.)

15428. Simplex Electric Co., Ltd.—Mounting arrangements for transparent panels in oven doors. 9th May, 1957. (820635.)

15579. Philips Electrical Industries, Ltd.—Circuit arrangements for igniting valves having liquid cathodes. 18th May, 1956. (820805.)

15865. Ever Ready Co. (Great Britain), Ltd., and Worboys, A. F.—Lamps. 9th April, 1957. (820500.)

16145. General Electric Co., Ltd.—Radiographic apparatus. 24th May, 1957. (821106.)

16777. Officine Meccaniche Riunite S.p.A.—Apparatus for starting a.c. slipring motors. 30th May, 1956. (820638.)

16915. Nippon Telegraph & Telephone Public Corporation.—Dial impulse register. 31st May, 1956. (820864.)

18099. High Voltage Engineering Corporation.—Apparatus for producing ions and bombarding a target therewith for use in restricted areas such as boreholes. 12th June, 1956. (820893.)

18370. English Electric Co., Ltd.—Frequency responsive electric circuit arrangements and control systems. 14th June, 1957. (821108.)

19631. Zenith Radio Corporation.—Analogue computing apparatus. 25th June, 1956. (820957.)

20087. Lignes Telegraphiques et Telephoniques.—Ferromagnetic materials of the ferrite type and methods of manufacturing same. 28th June, 1956. (820959.)

20541. Perkin-Elmer Corporation.—Continuously adjustable electric potential dividing system, in particular for analogue computers. 3rd July, 1956. (820639.)

22562. Mullard Radio Valve Co., Ltd.—Cathodes. 16th July, 1957. (820504.)

23074. Cook, E.—Electrically operated pictorial projection apparatus. 25th July, 1957. (Cognate application 21658, 9th July, 1957.) (820741.)

24091. Wilkinson Sword, Ltd., and Graviner Manufacturing Co., Ltd.—Temperature responsive electric switches. 1st August, 1957. (820742.)

25665. Philips Electrical Industries, Ltd.—Methods of manufacturing transformer coils. 22nd August, 1956. (820641.)

26728. Heberlein & Co. A.G.—Apparatus for the continuous electrical heat treatment of textile yarns. 31st August, 1956. (821146.)

26815. Allmänna Svenska Elektriska A.B.—Arrangement for introducing d.c. excitation in a group of current transformers feeding a common load. 3rd September, 1956. (820642.)

27608. Marconi Instruments, Ltd.—Tools for grinding to predetermined electrical resistance. 30th May, 1957. (821064.)

27888. Marconi's Wireless Telegraph Co., Ltd. — Waveguide-to-coaxial line transformers. 11th June, 1957. (821150.)

28063. General Electric Co., Ltd.—Refractor members for use in lighting fittings. 22nd October, 1957. (820868.)

28750. Revo Electric Co., Ltd.—Street or like lighting fittings. 17th September, 1957. (820414.)

29182. Associated Fire Alarms, Ltd., and Jackson, J.—Electric emergency switches. 24th September, 1957. (820453.)

29557. Mullard, Ltd.—Photo-conductive cells. 16th August, 1957. (820895.)

29676. English Electric Co., Ltd.—Hydraulic reaction turbines. 13th September, 1957. (820576.)

Continued overleaf

NEW PATENTS (*continued*)

30461. Collins Radio Co.—High frequency tuning device. 5th October, 1956. (820507.)

30932. Ferranti, Ltd.—Magnetic storage devices. 11th October, 1956. (820645.)

31039. Davidson & Co., Ltd.—Collection of dust from gases by electrostatic precipitation. 4th November, 1957. (820415.)

32581. British Thomson-Houston Co., Ltd.—Air or gas blast electric circuit-breakers. 17th January, 1958. (821069.)

33019. Automatic Telephone & Electric Co., Ltd.—Telephone systems. 15th October, 1957. (820898.)

34488. Chamberlain & Hookham, Ltd., and Deacon, L. O.—Electrical demand indicating instruments. 7th November, 1957. (820749.)

35061. Revo Electric Co., Ltd.—Street and like overhead lighting fittings. 11th November, 1957. (821153.)

35170. Soc. Industrielle de Liaisons Electriques.—Connections for electric leads and like solid, twisted and tubular metal parts. 16th November, 1956. (Addition to 755557.) (820899.)

35204. Lear, Inc.—Electromagnetic clutch. 17th November, 1956. (820647.)

35463. Licentia Patent - Verwaltungs G.m.b.H.—Retaining ring for supporting the end portions of the rotor winding of a high speed dynamo-electric machine. 20th November, 1956. (820577.)

35491. Texas Instruments, Inc.—Method of fixing electric leads to a silicon element and article resulting therefrom. 20th November, 1956. (820900.)

36032. Libbey-Owens-Ford Glass Co.—Electrically conductive articles. 26th November, 1956. (820578.)

38376. General Motors Corporation.—Push-pull transistor oscillators. 17th December, 1956. (820813.)

39410. Parsons & Co., Ltd., C. A.—Nuclear reactors. 16th October, 1957. (820579.)

39663. Soc. de l'Accumulateur Fulmen.—Controlled electric rectifier devices. 31st December, 1956. (820652.)

1957

239. Varian Associates.—Microwave wattmeter. 2nd January, 1957. (820420.)

346. British Thomson-Houston Co., Ltd.—Rotor assemblies. 31st December, 1957. (Cognate application 37899, 5th December, 1957.) (820902.)

463. Standard Telephones & Cables, Ltd.—Semiconductor diode. 4th January, 1957. (820903.)

844. Admiral Corporation.—Frequency selective amplifiers. 9th January, 1957. (820717.)

1938. Philips Electrical Industries, Ltd.—Fluorescent lighting fittings. 20th March, 1958. (820976.)

2473. British Insulated Callender's Cables, Ltd.—Multicore cable joints and connectors therefor. 23rd January, 1958. (820421.)

3852. Telefonaktiebolaget L. M. Ericsson.—Apparatus for identifying or finding a marked or indicated circuit or wire. 4th February, 1957. (820817.)

4130. Luers, G.—Apparatus for removing insulation from electric cables or other insulated conductors. 6th February, 1957. (820656.)

4154. United Kingdom Atomic Energy Authority.—Dead-time loss compensating circuits. 28th January, 1958. (821162.)

4158. British Broadcasting Corporation.—Televising of motion picture film. 28th January, 1958. (821163.)

4204. Crabtree & Co., Ltd., J. A., and Morgan, R. W.—Electric tumbler switches. 9th January, 1958. (821076.)

4397. Standard Telephones & Cables, Ltd.—Ferromagnetic ceramic materials with rectangular hysteresis cycle. 8th February, 1957. (820855.)

4747. Young, J. N.—Electromagnetic apparatus for positioning a control element. 12th February, 1957. (821164.)

4861. Electric & Musical Industries, Ltd.—Magnetic deflecting circuits for a cathode-ray tube. 13th February, 1958. (820756.)

6209. Elektroschaltgeräte Grimma Veb.—Transformers. 25th February, 1957. (820585.)

8609. Marie, G. R. P.—Radar apparatus. 15th March, 1957. (821171.)

8661. Babcock & Wilcox Co.—Nuclear steam generator. 15th March, 1957. (820466.)

11373. Sperry Rand Corporation.—Means for eliminating sneak currents in cascaded magnetic amplifiers. 8th April, 1957. (821181.)

19307. Forges et Ateliers de Constructions Electriques de Jeumont.—Control system for railway vehicles driven by electric motors supplied with rectified current. 19th June, 1957. (820596.)

20480. General Electric Co.—Capacitors and mountings therefor. 28th June, 1957. (820824.)

20534. Hafler, D.—Audio frequency transformers. 28th June, 1957. (820597.)

22967. British Thomson-Houston Co., Ltd.—Digital-to-analogue convertors. 19th July, 1957. (821187.)

23154. Commissariat a l'Energie Atomique.—Compensated ionisation chambers. 22nd July, 1957. (821188.)

23983. Landis & Gyr A.G.—Thermally-operated snap-action electric switch. 29th July, 1957. (820682.)

24433. Maschinenfabrik P. Pfenningsberg G.m.b.H.—Control systems for electrically operated washing machines. 1st August, 1957. (820599.)

29650. Mullard, Ltd.—Manufacture of thermionic cathodes. 5th May, 1958. (820915.)

33821. Compagnie Générale de Télégraphie sans Fil.—Directional aerials. 30th October, 1957. (820877.)

34720. Loblite, Ltd.—Electrical plugs, sockets, and adaptors. 7th November, 1957. (820687.)

35634. Londex, Ltd. (Deutsche Londex G.m.b.H.).—Electric circuits controlled by light sensitive elements. 15th November, 1957. (820608.)

36149. Western Electric Co., Inc.—Electrical transmission lines. 20th November, 1957. (821009.)

37152. Chicago Telephone Supply Corporation.—Electrical switches and terminal arrangements therefor. 9th December, 1955. (Divided out of 820851.) (820852.)

37289. Standard Telephones & Cables, Ltd.—Pulse communication system. 29th November, 1957. (820923.)

1958

2937. Allmänna Svenska Elektriska A.B.—Air blast electric circuit-breakers. 29th January, 1958. (821198.)

13241. Siemens & Halske A.G.—Roll-type capacitors and processes for the manufacture thereof. 25th April, 1958. (820927.)

TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks. Objections may be entered up to 7th November:—

Mullard (design). No. B789,736. Class 7. Electric welding machines and parts; electricity generators, dynamos for cycle lighting sets and dynamos for hand torches; etc. **Mullard** (design). No. B789,739. Class 10. X-ray apparatus and instruments and X-ray tubes, all for surgical, medical, dental, veterinary, scientific and industrial purposes; electro-medical apparatus; and parts; devices for protection against X-rays, and hearing aids for the deaf. **Mullard** (design). No. B789,740. Class 11. Heating apparatus and parts; cooking, refrigerating, drying, ventilating, air-conditioning and lighting installations and apparatus, and parts; electric lamps for use in photography; electric torches; and filters.—Mullard, Ltd., Mullard House, Torrington Place, London, W.C.1.

Berco. No. B775,007. Class 9. Resistors, potentiometers, current transformers, relays, voltage stabilisers and line volage regulators; electrical measuring apparatus; and electrical switchgear and parts.—British Electric Resistance Co., Ltd., Queensway, Enfield, Middlesex.

Rotapulse. No. B783,542. Class 9. Electrical apparatus for converting the rotary motion of a shaft into electrical impulses.—Ericsson Telephones, Ltd., 22, Lincoln's Inn Fields, London, W.C.2.

Gyp. (design). No. 784,043. Class 9. Valves (not parts of machines) operated automatically by electric current control, by solenoid, and by temperature and other changes in physical conditions.—High Pressure Components, Ltd., Sunflex Works, Colham Mill Road, West Drayton, Middx.

Corrusteel. No. 788,229. Class 9. Electric conduits made wholly or principally of steel. **Corruloco.** No. 790,835. Class 9. **Corrusig.** No. 790,836. Class 9. Covered electric wire and electric cables; and electric conduits.—Wandleside Cable Works, Ltd., 106, Garratt Lane, Wandsworth, London, S.W.18.

Stella. No. 788,387. Class 9. Electronic discharge tubes (not for lighting purposes); microphones; instruments for measuring light; apparatus for recording and reproducing sound by means of magnetic tapes; electric ballasts and electric starting apparatus, all for use with electric discharge lamps; high frequency apparatus and ultra-violet apparatus; loudspeakers; capacitors, transformers, condensers and current rectifiers, etc.—Stella Lamp Co., Ltd., 158-160, Shaftesbury Avenue, London, W.C.2.

Emcel. No. 787,159. Class 9. Electrical and electronic apparatus for controlling and measuring humidity and temperature, and parts.—Machine Control, Ltd., 15, Jermyn Street, London, S.W.1.

Mercon. No. 788,721. Class 9. Cables, filaments, insulated wires, tapes and rods, all being electricity conductors.—Mersey Cable Works, Ltd., Linacre Lane, Bootle, Liverpool, 20.

Amplex. No. 788,761. **Amplux.** No. 788,762. Class 10. Electro-medical acoustic apparatus, hearing aids, apparatus for detecting and estimating the degree of deafness, and parts.—Amplivox, Ltd., Beresford Avenue, Wembley, Middx.

Philips. (design). No. 789,405 and No. 789,406. Class 10. Electrically-operated hearing aids for the deaf, and parts.—Philips Electrical, Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

Cosyglo. No. B722,927. Class 11. Domestic electric fires.—General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.

Angelite. No. B785,992. Class 11. Electric lamps for lighting purposes.—Angel Warehouse Co., Ltd., Angel House, 214-216, Kingsland Road, London, E.2.

Birlefco. (design). No. 784,658. Class 11. Heating apparatus, heating installations; refrigerating and ventilating installations and apparatus; drying installations and apparatus, none being machines; and parts.—Birlec-Efco (Melting), Ltd., 33, Grosvenor Place, London, S.W.1.

Creda Quickie. No. B786,952. Class 11. Electrical installations for cooking and heating.—Simplex Electric Co., Ltd., Broadwell, Oldbury, near Birmingham.

Neosync. No. 790,934. Class 15. Electric organs and parts.—Sydney S. Bird & Sons, Ltd., Cyldon Works, Fleets Lane, Poole, Dorset.

NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged

MONDAY, 26th OCTOBER

Aberdeen.—The University. Institute of Physics, Scottish Group. "Thermonuclear Processes," by Sir George Thomson.

Birmingham.—James Watt Memorial Institute, 6 p.m. I.E.E. South Midland Electronics and Communications Group. "Reliability of Electronic Equipment," by A. G. Field.

Brigg.—Angel Hotel, 6.45 p.m. I.E.E. Sheffield Sub-Centre. Chairman's address, "Permanent Magnets and the Electrical Engineer," by F. G. Tyack.

Bristol.—S.W.E.B. Demonstration Theatre, Colston Avenue, 6 p.m. I.E.E. Western Utilisation Group. Section chairman's address, by T. E. Houghton.

Cambridge.—Cavendish Laboratory, 7 p.m. I.E.E. East Anglian Sub-Centre. Discussion on "Teaching of Electricity to Engineers and Physicists."

Chester.—Town Hall, 6.30 p.m. I.E.E. Mersey and North Wales Centre. Informal Paper on "H.V. D.C. Transmission with special reference to Cross-Channel Cable," by F. J. Lane.

Leeds.—Houldsworth School of Applied Science, the University, 7.30 p.m. Institution of Plant Engineers, West and East Yorkshire Section. "A.C. Motors and their Application," by F. T. Bartho.

Newcastle-on-Tyne.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North Eastern Centre. "The Provision of Adequate Electrical Installations in Buildings." (a) Multi-Storey Flats and Maisonnettes," by C. A. Belcher, and (b) "Commercial Buildings," by E. E. Jacobi.

TUESDAY, 27th OCTOBER

Canterbury.—County Hotel, 8 p.m. A.S.E.E. East Kent Branch. "Protective Equipment for Industrial Plant," by Dr. W. L. Stern.

Cardiff.—At the South Wales Institute of Engineers, Park Place, 7.30 p.m. Institution of Plant Engineers, South Wales Branch. "Properties of Molybdenum Disulphide and its Use as Plant Engineering Material," by H. P. Jost.

Chelmsford.—Electricity Showrooms, 7 p.m. I.E.E. London Graduate and Student Section, Chelmsford district meeting. "Remote Observation Using Closed Circuit Television," by L. A. Harris.

Coventry.—At the G.E.C., Ltd., Stoke, 7 p.m. I.E.E. South Midland Graduate and Student Section. Student's best paper.

Glasgow.—Royal College of Science and Technology, George Street, 6 p.m. I.E.E. South-West Scotland Sub-Centre. "Ultra-Sound Image Camera," by C. N. Smyth and J. Sayers.

The University, 7.15 p.m. Institute of Physics, Scottish Branch. "Thermonuclear Processes," by Sir George Thomson.

Leeds.—The University, 7 p.m. I.E.E. North Midland Graduate and Student Section. Members' views on controversial issues.

London.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurement and Control Section. Discussion on "Future Trends in Memory Stores for High Speed Digital Computers," opened by W. Renwick.

At the Federation of British Industries, Tothill Street, S.W.1, 6 p.m. I.E.S. Golden Jubilee lecture, "Light and Productivity," by A. N. Irens.

Malvern.—Winter Gardens, 7 p.m. British Institution of Radio Engineers, South Midlands Section. "Superconducting Computer Components," by Mrs. L. M. Roberts.

Manchester.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North Western Measurement and Control Group. "The Influence of Consumers' Load/Consumption Characteristics on Metering Practice," by L. B. S. Golds.

Engineers' Club, Albert Square, 2.30 p.m. Combustion Engineering Association, North Western Region. Discussion on "Problems in Oil Firing and Their Solution," opened by J. Scott.

TUESDAY, 27th OCTOBER to FRIDAY, 30th OCTOBER

London.—Olympia. Dairy Show.

WEDNESDAY, 28th OCTOBER

Barrow.—North Western Electricity Board Demonstration Theatre, Duke Street, 7.15 p.m. I.E.E. North Lancashire Sub-Centre. "Discrimination Between H.R.C. Fuses," by E. Jacks.

Cardiff.—College of Advanced Technology, 6.30 p.m. British Institution of Radio Engineers, South Wales Section. "Stereophonic Sound and Electrostatic Loudspeakers."

Welsh College of Advanced Technology, Cardiff, 6.45 p.m. Society of Instrument Technology, South Wales Section. "Control Systems as Applied to Railway Signalling," by J. C. Kubale.

London.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Electronics and Communications Section. Chairman's address, "Development of Eurovision," by M. J. L. Pulling.

I.E.E. London Graduate and Student Section. Visit to Mullard Radio Valve Co., Ltd., Mitcham (2 p.m.).

Connaught Rooms, W.C.2, 12.30 for 12.50 p.m. Batti-Wallahs' Society. Luncheon. Guest speaker, Mr. G. R. N. Garratt.

School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, W.C.1, 6.30 p.m. British Institution of Radio Engineers, Radar Group. "Radio—Its Impact on Shipping," by Captain J. D. F. Elvish. "A Historical Survey of Radar and Radio Aids to Aircraft Navigation," by Air Marshal Sir Raymund G. Hart.

Rugby.—College of Technology and Arts, 6.30 p.m. I.E.E. Rugby Sub-Centre. "The Deltic Locomotive," by C. M. Cock. (Joint meeting with the Rugby Engineering Society.)

THURSDAY, 29th OCTOBER

Cheltenham.—Gloucestershire Technical College, 7 p.m. I.E.E. Bristol Graduate and Student Section. "Some Principles Developed in the Application of Digital Computers to the Design of Electrical Plant," by B. J. Chalmers.

Chester.—English Speaking Union, Stanley Palace, Watergate Street, 7 p.m. Society of Instrument Technology, Chester Section. "Industrial Uses of Computers," by R. H. Tizard.

Dundee.—Electrical Engineering Department, Queen's College, 7 p.m. I.E.E. North Scotland Sub-Centre. Sub-Centre chairman's address, by A. J. O. Cruickshank.

Grangemouth.—"Ellwyn" Restaurant, Newlands Road, 7 p.m. Society of Instrument Technology, Grangemouth Section. "Electrode Problems in Plant pH Measurement," by Dr. G. Mattock.

Hove.—New Imperial Hotel, First Avenue, 7.30 p.m. A.S.E.E. Brighton, Hove and District Branch. "Application of Temperature Control."

Sheffield.—Grand Hotel, 7.30 p.m. Institution of Plant Engineers, Sheffield and District Branch. "Lifting Tackle," by G. E. Simm, Jnr.

FRIDAY, 30th OCTOBER

Aberdeen.—Robert Gordon's Technical College, 7.30 p.m. I.E.E. North Scotland Sub-Centre. Chairman's address, by A. J. O. Cruickshank.

Glasgow.—Building Centre, Sauchiehall Street, 7.15 p.m. Society of Instrument Technology, Scottish Section. "Instrumentation of Hunterston Nuclear Generating Station," by T. M. Dowall.

Hanley.—Grand Hotel, 7.30 p.m. A.S.E.E. Stoke and Crewe Branch. "Hospital Electrical Installations," by G. Middlemas.

Leamington Spa.—A.S.E.E. Coventry and District Branch, 7.30 p.m. Visit to Lockheeds, Ltd.

London.—County Hall, S.E.1, 7 for 7.30 p.m. I.E.S. Reception.

14, Rochester Row, S.W.1, 7 p.m. Junior Institution of Engineers. "Planning a Computer Job," by M. G. Ferrand.

Stoke - on - Trent.—Technical College, 7 p.m. I.E.E. North Staffordshire Sub-Centre. "The Design and Performance of the Gas-Filled Cable System," by E. P. G. Thornton and D. H. Booth.

SATURDAY, 31st OCTOBER

London.—I.E.E. London Graduate and Student Section, 2.30 p.m. Visit to Independent Television Authority, Croydon.

Radiation Monitor

A survey trolley has been developed by the C.E.R.N. Health Physics Group for the routine monitoring of the radiation from the 50 MeV proton linear accelerator and the 600 MeV synchrocyclotron in the C.E.R.N. Nuclear Research Centre at Geneva. On the top of the trolley are mounted two dose rate meters, manufactured by Electronic Instruments, Ltd., one with a tissue equivalent ionisation chamber, and one with an argon or carbon dioxide chamber. From the two values of ionisation current the dose rates of gamma rays and heavy particles can be calculated separately. Pen recorders are usually used with the electrometers. The instruments on the lower shelves are portable meters for slow neutrons, fast neutrons and gamma rays. The trolley is equipped with a battery and motor generator enabling it to be used in areas remote from mains power supplies.

Mobile radiation monitor

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Australia.—Postmaster General's Department, Melbourne. 10th December. Transmitting valves. (E.S.B. 24361/59. Ten/42660.)*

Belfast.—Board of Governors, Methodist College. 20th November. Extension and modification to existing electrical installation in the Methodist College. McCandless & Barton, consulting engineers, 6, Murray Street, Belfast.

Belgium.—Service Générale des Construction Militaires, Brussels. Armoured telephone cables, junction boxes and terminal heads. (G.D. 5055/58. Ten/42707.)*

Ceylon.—Tender Board, Ministry of Works, Colombo. 4th November. Diesel and electrically driven pumps. (E.S.B. 24529/59. Ten/42702.)*

Down.—County Education Committee. 5th November. Electrical installation in Newtownards (New) Grammar School. McAusland, Abbott & Partners, consulting engineers, 16, Bedford Street, Belfast.

Formosa.—Central Trust of China, Taipei. 9th November. Electrical apparatus, including rheostat, battery charger, transformers, etc. (E.S.B. 24243/59/I.C.A. Ten/42662.)* 17th November. Hydraulic turbine driven a.c. generators. (E.S.B. 24684/59/I.C.A. Ten/42738.)*

Greece.—Greek General Air Staff, Athens. Armoured cable and telephone sets, supply and installation of overhead line. (G.D. 5780/58. Ten/42659.)*

India.—India Store Department. 26th November. Electric furnace. (See this issue.)

Isle of Wight.—Water Board. 1st December. Automatic pumping installation, comprising nine electro-submersible pumps, together with meters, controls, switchgear, transformers, etc., in connection with the modernisation of Carisbrooke pumping station, Contract No. 1. Engineer and manager, 58, St. John's Road, Newport, I. of W.

New Zealand.—General Post Office, Wellington. 3rd November. Black polythene adhesive tape. (E.S.B. 24349/59. Ten/42593.)* 11th November. Ten transmitter-receivers. (E.S.B. 24350/59. Ten/42609.)* 23rd November. Connectors, plugs, valve sockets and switches. (E.S.B. 24412/59. Ten/42674.)* 30th November. Radio interference suppression components. (E.S.B. 24628/59. Ten/42705.)*

Auckland Electric Power Board. 20th November. Insulated cable. (E.S.B. 24438/59. Ten/42645.)* Insulated cable. (E.S.B. 24439/59. Ten/42647.)* Insulated cable. (E.S.B. 24437/59. Ten/42673.)* 4th December. 11 kV switchgear. (E.S.B. 24436/59. Ten/42648.)*

Pakistan.—Water and Power Development Authority, Old Anarkali. 30th October. Steel tubular poles. (E.S.B. 23813/59. Ten/42555.)*

Management, Telephone Factory, Haripur. 14th November. Copper wires and cables. (E.S.B. 24593/59/I.C.A. Ten/42712.)*

Portuguese East Africa. — Government Purchasing Commission, Lourenço Marques. 30th October. H.v. to l.v. 300 kVA transformer for soil testing laboratory. (E.S.B. 24538/59. Ten/42688.)*

Nampula Municipality. One 1,000 kVA or alternatively two 500 kVA generating sets. (E.S.B. 24539/59. Ten/42689.)*

Reigate.—Borough Council. 31st October. Supply and erection of 30 group "A" steel lighting columns and ancillary equipment on Reigate Hill Road, A.217. Borough surveyor, Town Hall.

Rhodesia and Nyasaland.—Salisbury City Council. 17th November. Fluorescent lighting fittings. (E.S.B. 24586/59. Ten/42691.)* Circuit-breakers, contactors, current transformers and ammeters. (E.S.B. 24583/59. Ten/42690.)*

South Africa.—Union Tender Board, Pretoria. 29th October. Six pulse echo fault locators. (E.S.B. 24340/59. Ten/42588.)*

Durban City Council. 30th October. Cable terminal boxes. (E.S.B. 24758/59. Ten/42768.)* Telephone cable. (E.S.B. 24757/59. Ten/42769.)* Telephone cordage. (E.S.B. 24759/59. Ten/42760.)*

Pretoria City Council. 12th November. Thirty 200 kVA transformers. (E.S.B. 24707/59. Ten/42729.)*

South West Africa.—Tender Board, Windhoek. 30th October. Rectifier charging unit. (E.S.B. 24188/59. Ten/42560.)* Battery chargers and combustion efficiency and tune-up testers. (E.S.B. 24175/59. Ten/42566.)* Engine testing dynamometer. (E.S.B. 24174/59. Ten/42580.)* Battery charger. (E.S.B. 24190/59. Ten/42575.)* 30th October. Transformer feeding rectifiers and frequency meter. (E.S.B. 24189/59. Ten/42559.)*

Sudan.—Controller of Stores, Sudan Railways, Atbara. 21st December. Electric passenger and service lifts for a hotel. (E.S.B. 24362/59. Ten/42618.)*

Thailand.—Thai Technical and Economic Committee. 10th November. All-aluminium conductor, tie wire, bushings, guy strand wire. (E.S.B. 24012/59/I.C.A. Ten/42664.)*

Wandsworth.—Borough Council. 11th November. Traction batteries. (See this issue.)

West Riding.—County Council. 30th November. Radio telecommunications equipment. (See this issue.)

ORDERS PLACED

Eccles.—Housing Committee. Recommended. Electrical installation in 40 houses at Tindall Street (£1,573).—Francis I. Bampton.

Launceston.—Corporation. Supply and erection of steel columns, brackets, etc., for trunk road lighting.—Abacus Engineering.

London.—L.C.C. Electrical installations in blocks 1-12, Falcon Terrace, Battersea (£8,274).—Archibald Saville & Co. Electrical installations in blocks 1-8, Maitland Park site, St. Pancras (£13,358).—Electrical Contracting Co.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors

Basingstoke.—Houses (72), South Ham estate; E. Almond, borough architect.

Bedford.—Two blocks of five-storey flats and community centre; borough architect.

Billingham-on-Tees.—Houses (131), Roseberry Road; U.D.C. surveyor.

Chesham.—Houses (96), Bois Moor Road; C. Bryant & Son, Ltd., 65, Whitmore Road, Birmingham, 10.

Croydon.—Office block; G. C. Pillinger & Co., Ltd., Purley Way Works.

Dartford.—Houses (86), Wilmington; surveyor, Council Offices, West Hill.

Dunstable.—First phase of College of Further Education (main four-storey block, other single-storey buildings and workshop block); county architect, Shire Hall, Bedford.

Durham.—Additions to Consett Technical College (£17,000); R. Gallacher, Ltd., contractors, Laburnum Avenue, Blackhill.

New infants' school at Framwellgate Moor (£39,000); Middleton & Co., builders, Queen Alexandra Bridge Approach, Sunderland.

Residential block at St. Mary's College; Marshall Sission, architect, Farm Hall, Godmanchester, Huntingdon.

Gateshead.—Three blocks of 16-storey flats, Chandless area (£1,250,000); R. Berry, chief architect, Municipal Buildings.

Grimsby.—Works extensions; British Titan Products Co., Ltd., Pyewipe.

Holland (Lincs.).—Magistrates' court house, Long Sutton; county architect, County Hall, Boston, Lincs.

Huddersfield.—Houses (200), Deighton estate; borough architect, High Street Buildings.

Leicester.—Further work on City of Leicester Training College (£250,000); city architect.

Liverpool.—R.C. school, Northwood, Kirkby; L. A. G. Prichard & Son, architects, 14, Dale Street.

London.—Works extensions, Oxgate Lane, Cricklewood; Bovis, Ltd., 1, Stanhope Gate, W.1.

Lowestoft.—Works extensions; Brooke Marine, Ltd., Oulton Broad.

Over 300 houses to replace temporary bungalows; G. A. M. Gentry, borough engineer, 49, High Street.

Peterborough.—Extensions to Cromwell Road County school (£21,950) and first instalment of Werrington County Primary school (£61,403); Peterborough Joint Education Board, Bridge Street.

Peterlee.—Houses (270); Peterlee Development Corporation, Old Shotton.

St. Helens.—Omnibus garage; borough architect.

Skegness.—Hall, dining room and kitchen at County Infants' School (£13,788); county architect, Lincoln.

Stockport.—Three-storey office block with electric floor heating, St. Petersgate; borough architect, Town Hall.

Stoke-on-Trent.—Houses and bungalows (1,000), Trentham; Thomas Oakley, Ltd., Beechwood Road, Luton.

Stratford-on-Avon.—Factory, Masons Road; Stratford Auto Components, Ltd., Shottery Road.

Two blocks of two-storey flats and 24 houses, Masons Road estate; P. C. Smart, borough engineer, Municipal Offices.

Twickenham.—Dwellings (72), Richmond Road; borough engineer.

Wakefield.—Showrooms and offices, Lower Kirkgate; Calgary & Edmonton Land Co., Ltd., 43, Wimpole Street, London, W.1.

Walsall.—Grammar school, Sutton Road (£250,000); Matthew & Johnson-Marshall, architects, 24, Park Square East, London, N.W.1.

Welwyn.—Extensions (£79,000), for Spastics Training Centre, Digswell Hill; Paul Mauger, architect, 31, Church Street.

* Specifications may be inspected at the Export Services Branch, Board of Trade, Lacon House, Theobald's Road, London, W.C.1 (Chancery 4411; extension 769).